Alchemist Live SDI

User Guide

Version History

Date	Version	Release by	Reason for Changes
16/01/2018	1.0	Jon Metcalf	Initial release.
18/01/2018	1.1	Jon Metcalf	Update several bitmaps & reverse NIC designation.
26/01/2018	1.2	Jon Metcalf	Minor formatting updates.
20/03/2018	1.3	Jon Metcalf	Added Enhancer Controls
09/10/2018	1.4	Jon Metcalf	Update for V1.4.0.12
08/01/2019	1.5	Jon Metcalf	Correction – console section.
24/05/2019	2.0	Jon Metcalf	Update for V2.0.0.50
19/08/2019	2.1	Jon Metcalf	Added note on Orbit
20/11/2019	2.2	Jon Metcalf	IPMI section edited.
12/12/2019	2.3	Jon Metcalf	Update for V2.0.1.14
22/04/2020	2.4	Jon Metcalf	Update for V2.1.0.24
27/05/2020	2.5	Jon Metcalf	Update for V2.1.1.6
29/04/2021	2.6	Jon Metcalf	Update for V3.1.0.8 & post Belden rebrand
08/07/2021	2.7	Jon Metcalf	Add PhC Low mode
26/07/2021	2.8	Jon Metcalf	Update Orbit screenshots, for Orbit V5.3.0 release

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Table of Contents

1. Definitions, Acronyms and Abbreviations **8**

2. Introduction **10**

3. System Requirements / Prerequisites **11**

3.1 Alchemist Live SDI Hardware 12

4. GV Live Architecture **14**

5. Installing RollCall Control Panel (RCP) **14**

6. Using RCP via IP Proxy Service **15**

6.1 Configuring RollCall Proxy 15

6.2 Connecting to Alchemist Live using RCP 17

7. Using RCP in Orbit **21**

8. GV Live Template **27**

8.1 Agent Configuration 27

8.1.1 Agent Configuration 28

8.1.2 Available Agents 29

8.2 Time Sync Configuration 30

8.2.1 System Clock 30

8.3 SNMP 33

8.3.1 Read/Write Port 33

8.3.2 OID Count 34

8.3.3 Trap Send 34

8.3.4 MIB2 System Group 34

8.3.5 Community Names 34

8.3.6 Trap Receivers 35

8.4 NMOS 36

8.5 Logging 37

8.6 Logging-Network 38

8.7 Setup 39

8.7.1 RollCall Port 39

8.7.2 Unit Name 40

8.7.3 DDS for IP Routing 40

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8.7.4 License Server 41
8.7.5 Log Server 41
8.8 System 42
8.8.1 Detected Hardware 43
8.8.2 Version 43
8.8.3 Hostname 43
8.8.4 Power 43
8.8.5 Start Time 44
8.8.6 Network Interfaces 44
8.8.7 Switch Information (LLDP) 45
8.8.8 Hardware Monitoring 46
8.9 About 47
9. Configuring Alchemist Live 50
9.1 Unit status 50
9.2 Input status 50
9.3 Output Status 51
9.4 Client Control Mode 51
9.5 Input 52
9.5.1 Input Configuration: SDI Input / SDI Quad SQD / SDI Quad 2SI / SDI Quad Auto 52
9.6 Output 54
9.6.1 Output Configuration: SDI Input / SDI Quad Link 54
9.7 Conversion 55
9.7.1 Video Input: Interlaced / Segmented Frame (psf) / Progressive 56
9.7.2 Video Output: Interlaced / PsF / Progressive 56
9.7.3 Conversion Mode and Aperture 57
9.7.4 Aspect Ratio 60
9.7.5 Blanking: Left / Right / Top / Bottom 61
9.7.6 Ph.C Protect Areas 62
9.8 Utilities 65
9.8.1 Proc Amp: Y Gain / C Gain / Black Level 65
9.8.2 Luma Clipper: White Max / White Knee / Black Min / Black Knee 66

9.8.3 Color Space Conversion: Auto / REC601 / BT709 / BT2020 66
9.8.4 HDR Conversion 68
9.8.5 RGB Legalizer: Off / 700mV / 721mV / 735mV / Custom 77
9.9 Color LUTs 78
9.10 Audio 81
9.10.1 Dolby® E Stream Select * 82
9.10.2 Audio Channel Routing 84
9.10.3 Audio Output Channel Gain (dB) 87
9.10.4 Audio Delay (All Channels) 88
9.11 Dolby E 89
9.11.1 Stream Select 89
9.11.2 Channel Pair 90
9.11.3 Program Config 90
9.11.4 Sample Rate 90
9.11.5 Bit depth 90
9.12 Reference 91
9.12.1 Reference Mode 91
9.12.2 External Reference 91
9.12.3 Reference Status 92
9.12.4 Genlock Timing 92
9.13 Pattern Generator 93
9.13.1 Test Patterns 93
9.13.2 Caption Overlay 95
9.14 Logo Insertion 97
9.15 Closed Captions 100
9.15.1 Input Status 100
9.15.2 CEA-608/CEA-708 Caption Pass-Through 101
9.15.3 ARIB STD-B37/STD-B39 Pass-Through 103
9.16 VANC 104
9.16.1 VANC 1 to VANC 8 105
9.17 Logging 107

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9.17.1 Logging - Setup 107
9.18 Alchemist Live Setup 108
9.18.1 Unit Name 108
9.18.2 Agent STOP 109
9.18.3 Misc: Version/Start Time/Proc ID/CPU Mask/Current Log Server 109
9.18.4 License Information 110
9.18.5 Option Licensing 110
9.18.6 IP Routing 110
9.18.7 RTP Payload Type 111
9.18.8 System Configuration 111
10. The Console 114
10.1 Introduction 114
10.2 Accessing the Console 114
10.2.1 Retrieval of the License Lock Code: 116
10.2.2 Configure Network – Standard (Recommended) 116
10.2.3 Configure Network – Custom (Advanced) 120
10.2.4 Network Diagnostics 120
10.2.5 Set Time and Date 121
10.2.6 Upgrade GV Live 122
10.2.7 Add New License 123
10.2.8 Display License Info 123
10.2.9 Display Status 124
10.2.10 Retrieve Operational Logs 124
10.2.11 Restart 125
10.2.12 Shut Down 126
11. IPMI 127
11.1 Introduction 127
11.2 IPMI IP Address Configuration 127
11.3 Remote Access via web browser 131

Appendix A. System Latency 134

Appendix B. BIOS Settings 135

Appendix C. HTML5 Web Browser 137

Appendix D. RGB Legalizer 140

Appendix E. Dolby E Transcode Configuration 143

List of Tables

Table 1: Table of Terminology 8

Table 2: Supported Resolution/Framerate 113

***Dolby -** *Dolby is a registered trademark of Dolby Laboratories.*

1. Definitions, Acronyms and Abbreviations

Table 1: Table of Terminology

Term	Definition
Anamorphic	A method of carrying wide screen content, in a comparatively narrower aspect ratio transport.
BMC	**Baseband Management Controller:** A baseboard management controller (BMC) is a small, specialized processor used for remote monitoring and management of a host system.
DID	**Data identifier:** With regard to ancillary data, the DID indicates the type of ancillary data that the packet corresponds to.
GPU	**Graphical Processing Unit:** Very efficient, parallel compute engine for advanced image processing techniques.
HDR	**High Dynamic Range**. Is a representation that allows extended dynamic range (darker darks, brighter whites) by means of new transfer functions (EOTF/OETF) and Wide Color Gamut (WCG), which replaces the traditional CRT gamma curve and BT709 Colorspace.
IPMI	**Intelligent Platform Management Interface** - is a set of computer interface specifications for an autonomous computer subsystem that provides management and monitoring capabilities independently of the host system's CPU, firmware (BIOS or UEFI) and operating system.
License file	Defines the quantity of products available.
License Server	An application that manages product licenses.
License Lock Code	Lock code based on specific locking criteria. GV Live product licenses are locked to host machine that the sentinel service is installed on. Since GV Live products are all Turnkey, this will always be the Host Machine.
LUT	**Look Up Table:** LUT is a term used to describe a predetermined configuration for a specific HDR/Colorspace transform.
OID	**Object identifier**: Is an address used to identify devices and their statuses, in an SNMP system.
Orbit	A GV generic remote control application.
Ph.C	**Phase Correlation**: GV's advanced motion estimation algorithm.
RCP	**RollCall Control Panel:** A component of the RollCall Suite that can also be run as an add-on from within Orbit.
RollCall	A legacy GV generic remote control application
GV Live Agent	Virtual software instantiation which adopts a product type to perform a particular media processing function.
GV Live Host	Host software application which manages one or more GV Live agents.
S-DID	**Secondary Data Identifier:** With regard to ancillary data, like DID (see above) the S-DID indicates the type of ancillary data that the packet corresponds to.

Term	Definition
SDR	**Standard Dynamic Range**: Describes images/rendering/video using a conventional gamma curve, and therefore presenting a dynamic range that is considered standard.
Synchro	An Alchemist Live conversion mode, where conversion is achieved by a process of either repeating, or dropping source frames. No picture building is performed.
SNMP	**Simple Network Management Protocol:** Is an Internet Standard protocol for collecting and organizing information about managed devices on IP networks and for modifying that information to change device behaviour.
Synchro	An Alchemist Live conversion mode, where conversion is achieved by a simple process of either repeating, or dropping source frames. No picture building is performed.
Trap (SNMP)	**SNMP Traps** are alert messages sent from a remote SNMP-enabled device to a central collector.
UHD	**Ultra High Definition** – a 4K video format of a specific resolution: 3840x2160
VANC	**Vertical Ancillary Data:** is a packet of information inserted into the vertical blanking region of a video signal.
VPID	**Video Payload Identifier:** packets to describe the video format, in accordance to SMPTE 352. VPID information is employed by Alchemist Live for the automatic detection of incoming quad-link format: 2SI or square division.
WCG	**Wide Color Gamut**. ITU-R BT.2020 works together with the HDR functionality to offer a much wider color gamut than the traditional BT.709.

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2. Introduction

Alchemist Live SDI offers the very best motion compensated frame rate conversion for Live IP and SDI media streams.

Supporting **SD, HD, 3G, UHD, 4K** and **HDR** Alchemist Live provides transparent, artefact free conversion enabling seamless global distribution of live media.

Alchemist Live consists of software architecture combined with state of the art COTS hardware to offer GV's industry leading frame rate conversion quality in a 4U turnkey solution.

Alchemist Live offers native support for a single channel of UHD/4K, or up to three channels of 1080p, making it the most flexible solution available today. In addition, a suite of HDR processing tools are included enabling real-time conversion of SDR to HDR, HDR to SDR and HDR to other HDR formats.

The control interface for Alchemist Live is GV's generic RCP (RollCall Control Panel) which can be run either from RollCall, or via GV Orbit. Both RollCall Lite and Orbit Lite are available as free downloads. Alternatively, there is also an HTML5 web service available.

Alchemist Live runs on the GV Live software framework. This software architecture is the common platform for all the products in the GV Live product portfolio. It consists of a Host software application which manages software agents. Agents adopt a product type based on licenses installed.

For Alchemist Live, an agent represents a channel of process. In single channel UHD/4K mode, one agent will be running, and in three channel 1080p mode, three software agents will be running.

Important Information:

Three channel mode of operation:

- The same reference is shared across all three channels
- Changes to reference will affect the output of all three channels
- All three independent outputs are locked to the same temporal frequency
- All three inputs must be the same temporal frequency

For the above reasons, in the three channel mode of operation, channel one is the **master channel**. Channel one specifies the output temporal frequency of all three channels and channel 1 dictates the Genlock mode of operation for all three channels.

If the **input standard**, **output standard** or **Genlock mode** is changed on channel one, it will change the other two channels and therefore can cause a disturbance on the other two channels. In every other respect the channels are independent.

Users should always start by using channel one first and then move onto channels two and three respectively.

Single channel mode of operation:

- For UHD/4K SDI input can be either Quadlink; Square Division or 2SI
- The UHD/4K SDI output can be either Quadlink; Square Division or 2SI

Note – 12G is not currently supported, but may be added in the near future.

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3. System Requirements / Prerequisites

The control surface for Alchemist Live can be either:

- GV Orbit.
- RollCall RCP (RollCall Control Panel).
- HTML5 web service

GV Orbit: The Orbit control application is available as a free download from the GV Website here:

GV Orbit Download

GV Orbit should be installed on a remote PC either running Windows 7 or Windows 10.

RollCall Control Panel is available within the Orbit application.

At the time of writing, the latest version of Orbit is V5.3.0.

RollCall RCP: RCP (RollCall Control Panel) is a component part of the RollCall application. RollCall should be installed on a remote Windows computer.

At the time of writing, the latest RollCall Suite version is: V4.19.8.

RollCall Lite, of which RCP is a component part, is available as a free download from the GV Website here:

GV RollCall Download

Note that there must be an IP network connection between the PC running RCP and the Alchemist Live Host machine.

The default IP address on NIC 1 is 192.168.0.1 (see Appendix A for more details).

Note that this manual demonstrates control via RollCall RCP. However, Orbit RCP, and HTML5 templates are virtually identical to those of RollCall RCP.

HTML5 Web Service: added in V2.0.1.14, Alchemist Live may be controlled via an HTML5 Web service. This can be run directly from a web browser such as Chrome, or Mozilla Firefox, running on either Windows, Linux or Safari running on an Apple Mac.

See **Appendix C** below for more details.

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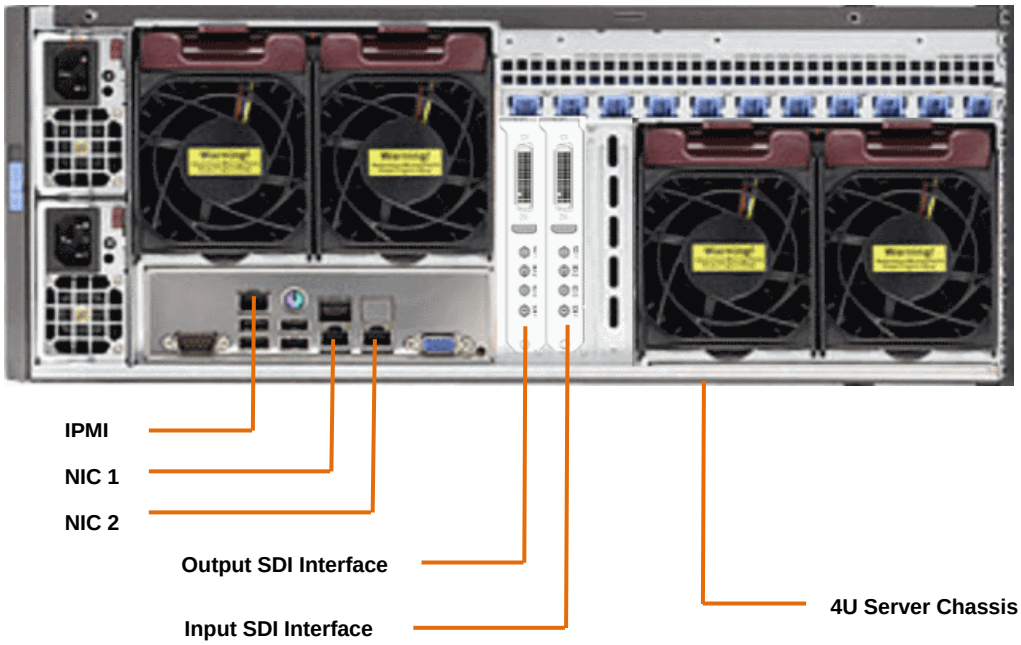
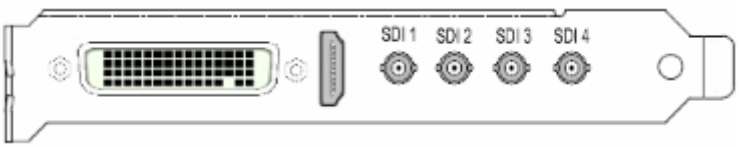
3.1 Alchemist Live SDI Hardware



The Alchemist Live Turnkey is based on a generic COTS Server enclosure.

The video interface is provided by 2x third party video interface PCIe cards.

Video Interface PCIe card



SDI video ports are provided by 4x micro BNC connectors.

The two PCIe cards are identical, but one is configured as an input device and the other as an output device.

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A pair of quad-link SDI cables is provided; one for the input and one for output. These will effectively interface the Micro BNC's of the interface card, to standard BNC.

Note – the Quadlink cable is generically marked as:

- SDI 1 (IN 1/A)
- SDI 2 (IN 2/B)
- SDI 3 (Out 3/A)
- SDI 4 (Out 2/B)

When employed in an Alchemist Live SDI Installation, the cables should just be referred to as SDI 1 to 4 (the bracketed info should be ignored).

A pair of breakout cables are also included.

In the first version of Alchemist Live SDI, this cable is only is only used for conveying an external reference signal to the output video interface card, hence only one breakout cable is required.

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4. GV Live Architecture

The **GV Live** software consists of a **Host**, an **Agent** and **License Server**.

The **GV Live Host** manages the **GV Live Agents**. Typically there would be one host per physical compute instance. From a RollCall perspective, the **GV Live Host** can be considered as a virtual IQ frame.

GV Live Agents are spawned by the Host and adopt a product type based on the nominated product license. Each agent has its own unique RollCall address just like a module would in a frame and can therefore be considered as a virtual slot.

The **License Server** is the local daemon that manages the product license/licenses. The daemon must be present upon start-up, for successful use of the product. If for any reason the license disappears there is a 7 day grace period before the product will stop working.

5. Installing RollCall Control Panel (RCP)

The Alchemist Live SDI does not have a dedicated control interface, but instead utilizes RCP.

Note – this guide is not an Orbit or RollCall tutorial.

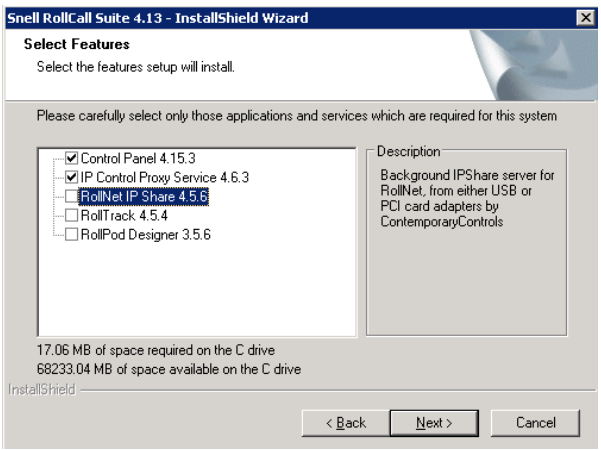
RCP may be either run as an add-on in Orbit, or via the RollCall suite.

RCP is the control application for the GV product range and is available to GV customers free of charge. Orbit, or RollCall, will need to be installed on a remote Windows PC with a network connection to the host machine.

Installing RollCall

Installation is very easy. Just launch the RollCall Suite Installer and follow the Install Wizard. Note that part way through the install process, it will be asked which RollCall components are to be installed. All components can be install if desired, but from an Alchemist Live SDI perspective, the important components are:

- **Control Panel**
- **IP Control Proxy Service**



Follow the RollCall installer wizard to complete the process.

Once installed, control of GV Live products is possible using RCP. It is recommended to use RCP via IP Proxy service.

6. Using RCP via IP Proxy Service

6.1 Configuring RollCall Proxy

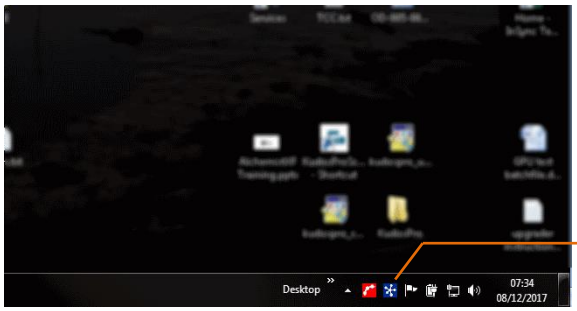
The following procedure will describe how to set up RollCall IP Control Proxy Service on a remote PC, on the same network as the GV Live host machine.

Note that the advantage of using the IP Control Proxy Service is that control of multiple GV products can be managed from a single RollCall control panel session, without the need to keep changing the connection IP Address. By using IP Control Proxy Service, Control Panel can be set to Localhost and all devices configured in the IP Control Proxy Service will be visible in the connection pane of Control Panel.

In this example, the GV Live application is configured in RollCall Proxy:

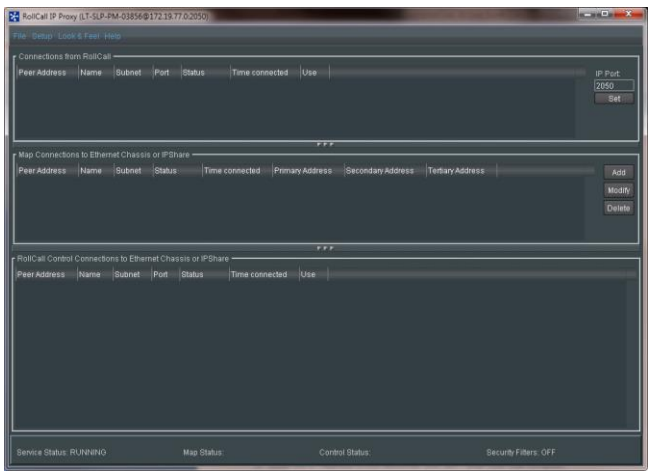
1. On the remote PC, where RollCall has been installed, note the RollCall launch icon, present on the task bar.

   Note – if it is not visible, go to: **Start/All Programs/Snell** and the RollCall Proxy application can be picked from the listed RollCall components.



RollCall Proxy application launch

Launch RollCall Proxy. The **RollCall IP Proxy** window will open:



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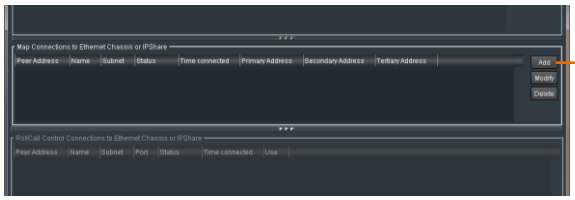
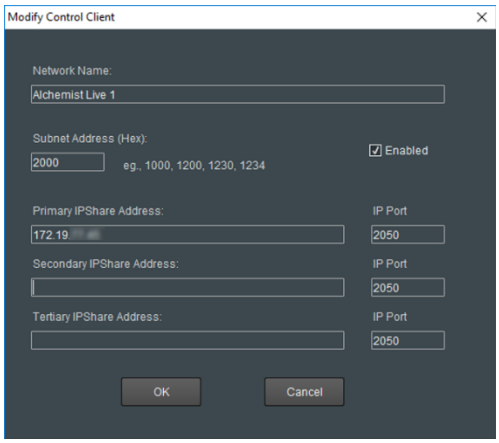
2. In the **Map Connections to Ethernet Chassis or IP Share** pane, select **Add**:



Select

The **Add a new Client** window will appear:

3. Populate the **Add a new Client**:



In this example, the Alchemist Live has been given the Network Name:

Alchemist Live 1

This unique name will enable it to be easily identified should multiple Alchemist Live systems be configured in RollCall Proxy

- The **Network Name** is usually an intuitive name that will allow easy identification of the device within the **Map Connections to Ethernet Chassis or IP Share** pane.
- The Subnet address needs to be set. The actual hex value set isn't important, as long as it's unique. If the Alchemist Live is the first item configured into RollCall Proxy, use the hex address **1000** (as in this example). If it's the second, use hex address 2000 (assuming 1000 has already been used).
- Enter the **Primary IPShare Address.** This is the IP Address of the Alchemist Live host machine. If this is not known at this point in time, see Appendix 1 below.

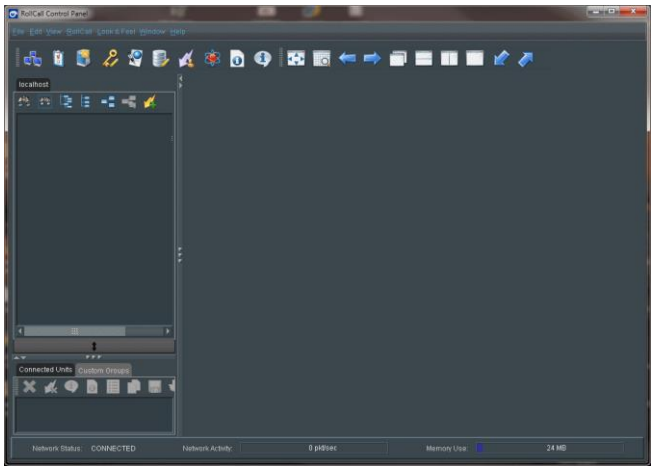
Click **OK.**

The configured Client will now appear in the **Map Connections to Ethernet Chassis or IP Share** pane.

6.2 Connecting to Alchemist Live using RCP

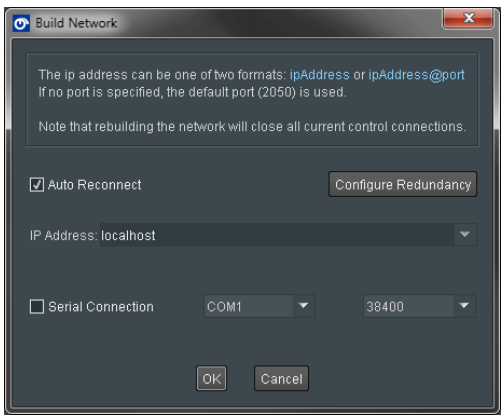
1. On the remote PC, open **RollCall Control Panel**, via the desktop icon:

The RollCall Control Panel will open:



2. Click on the **Connection** icon:

The **Build Network** Window will now appear:



The IP Address will default to: **localhost.** This is the required setting. If the IP Address is set to anything else, set it to: **localhost.**

Select **OK.**

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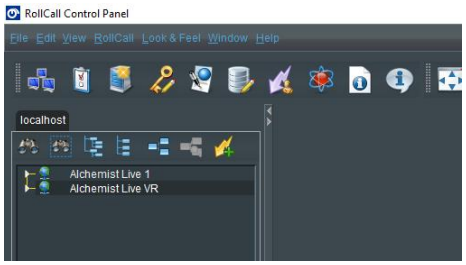
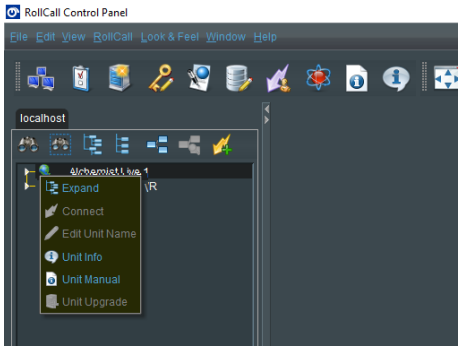
3. **Alchemist Live 1** will now appear in the RollCall connection pane:

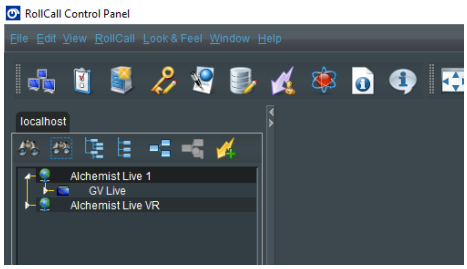


4. Right click on **Alchemist Live 1.**

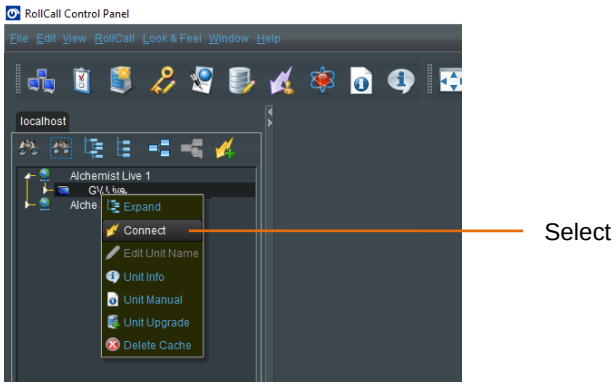
   A drop-down list will appear. Select **Expand**.



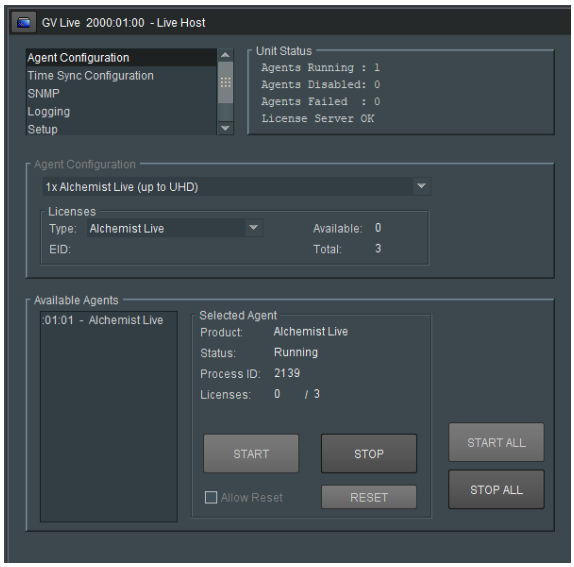
   GV Live will now appear:



5. Right click on **GV Live.** A drop-down list will appear. Select **Connect.**



The **GV Live Host** template will now load.



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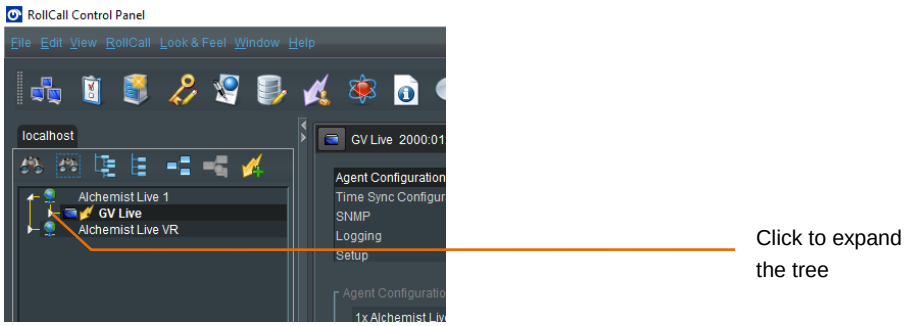
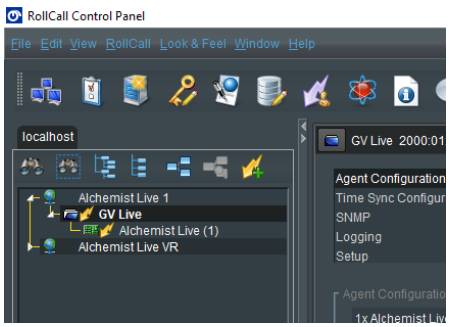
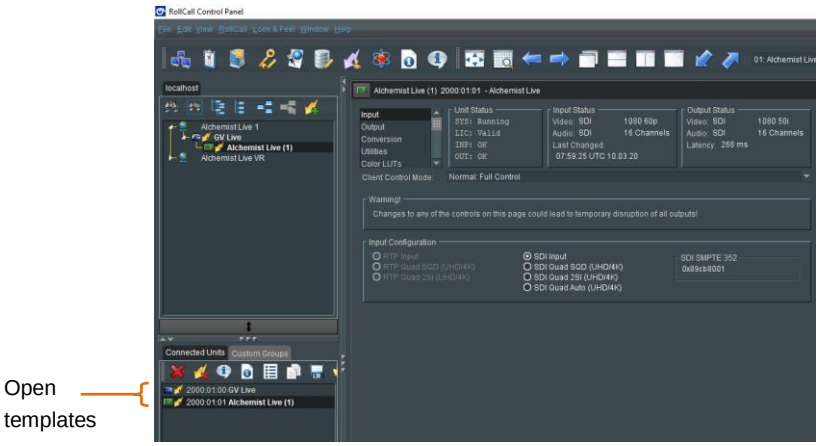
6. In the RollCall Connection pane, expand the tree by selecting the small white arrow to the left of the GV Live icon:



Alchemist Live (1) will appear:



7. Double click on the **Alchemist Live** listing, and the Alchemist Live RollCall Template will load:



Both the **GV Live** and **Alchemist Live** templates are now loaded and maybe configured.

Confirmation of the loaded templates is shown under the **Connected Units** tab.

It is possible to quickly change between templates, by simply clicking on the required template, in the **Connected Units** tab.

7. Using RCP in Orbit

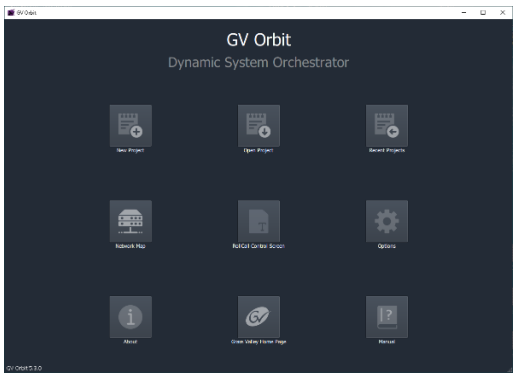
RCP can be run as a component of Orbit.

Note that Orbit is a GV's paid-for Automated Control and Monitoring application. For customers who already own Orbit, RCP can be run as a component within Orbit.

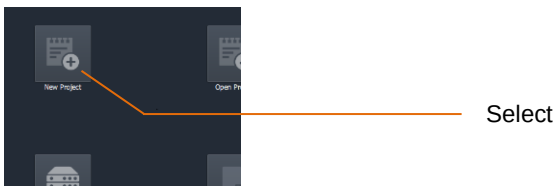
Orbit Lite is available as a free download. Orbit Lite also includes RollCall Control Panel and may be used to control Alchemist Live.

Procedure

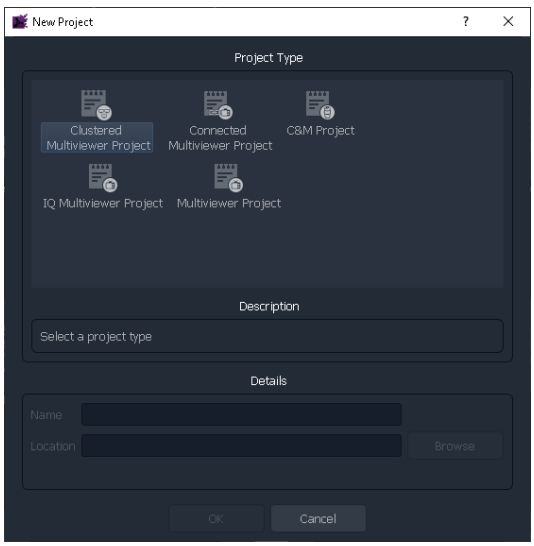
1. Open the Orbit control panel.



2. Select the **New Project** button:



A new window will open called **New Project**



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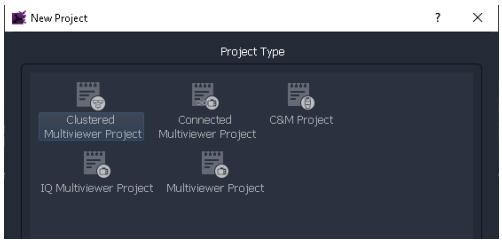
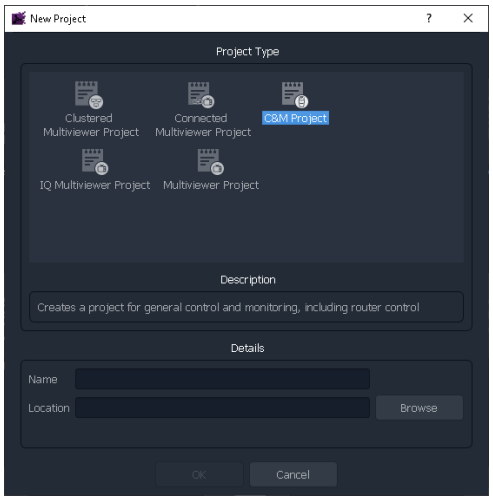
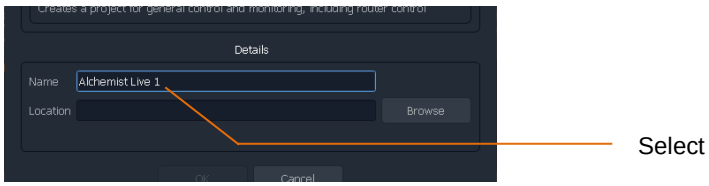
3. In the Project type pane, select **C&M Project**



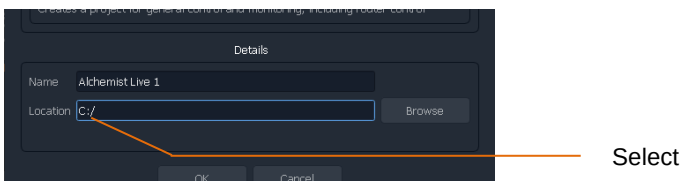
The New Project Window will update:



4. Enter a name for the new C&M Project. This can be anything the User chooses, but should be something to make future reference easier.

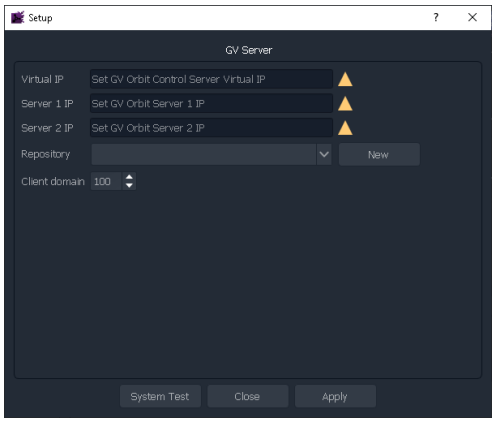


5. Enter a location where the new C&M Project is to be stored. The URL path can be entered manually, or by use of the Browse button:



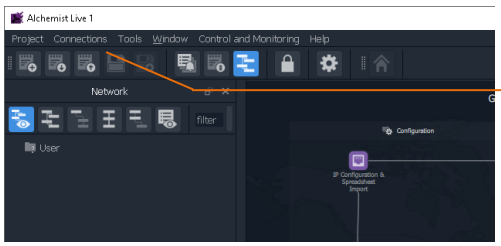
In this example the location is the root directory C:/

Click OK. This will prompt a new window called Setup to appear:

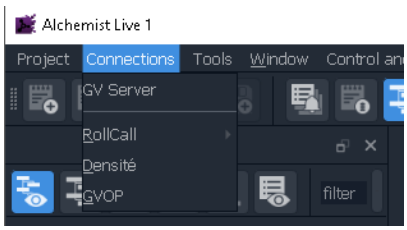


This can be simply closed.

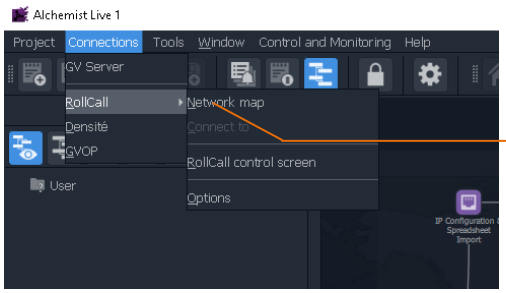
6. At the top of Orbit Client, click on **Connections**



Clicking **Connections** will expose a drop down menu:



7. In the Connections dropdown menu, select RollCall. This will expose a new dropdown menu:



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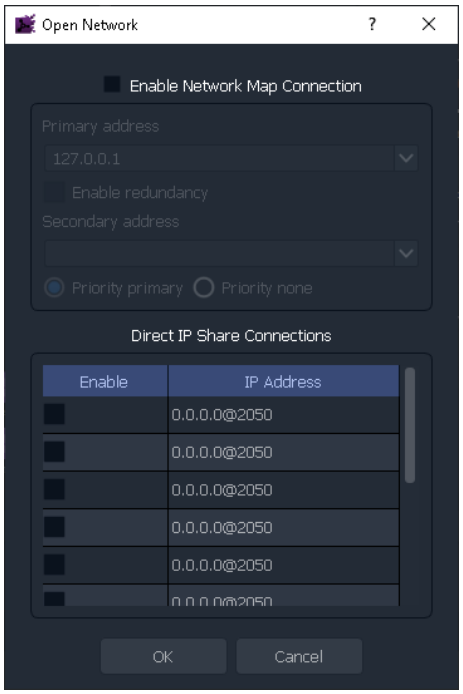
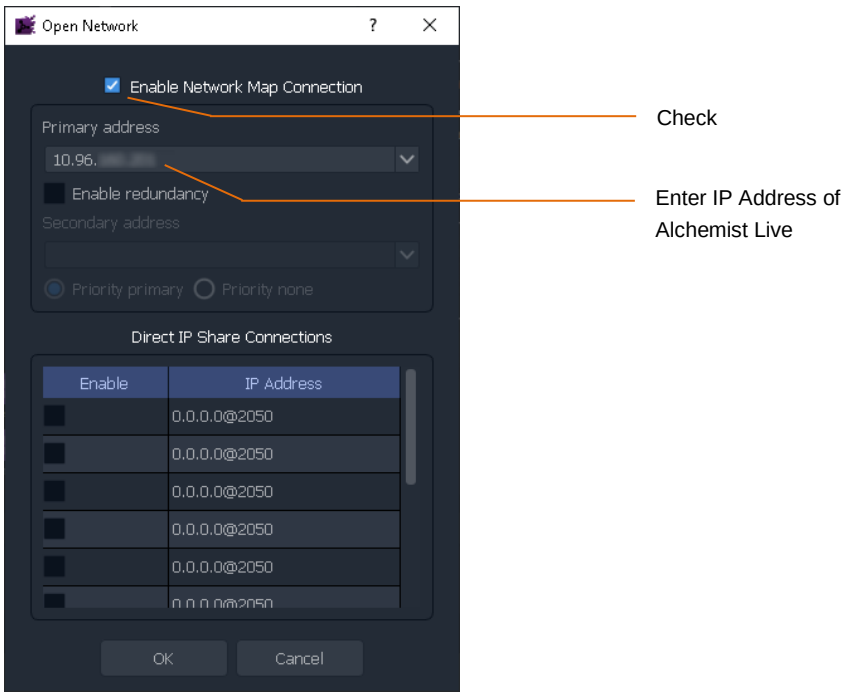
A new window called **Open Network** will appear:

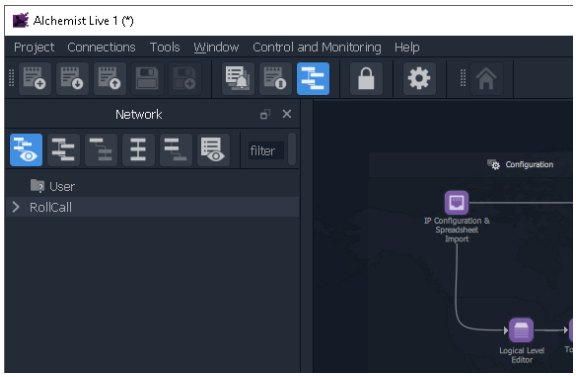


8. In the **Open Network** window, check the **Enable Network Map Connection** checkbox.

   This will make the **Primary address** field active. Enter the IP Address of the Alchemist Live that is to be controlled:

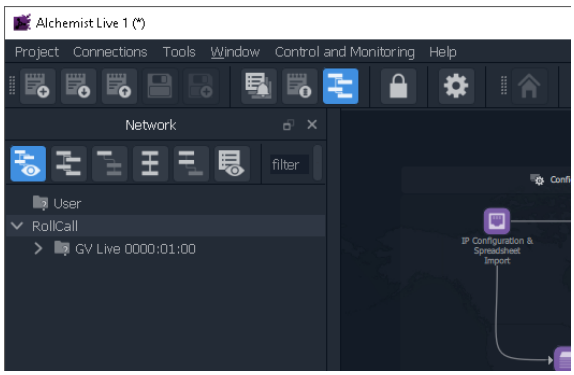


9. In the left hand pane of the Orbit Client a RollCall link will appear:

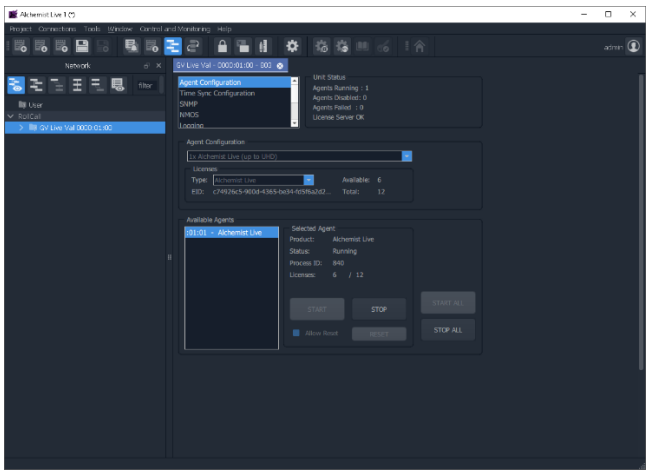


10. Click on the arrow adjacent to RollCall to expand the RollCall Tree

    The GV Live host Machine will appear:



    Double click on the GV Host. The GV Live Host template will now open:



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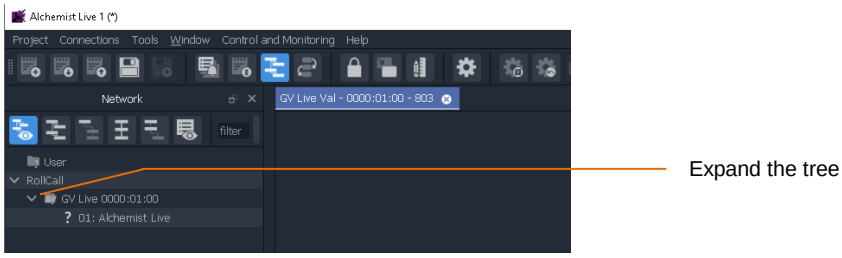
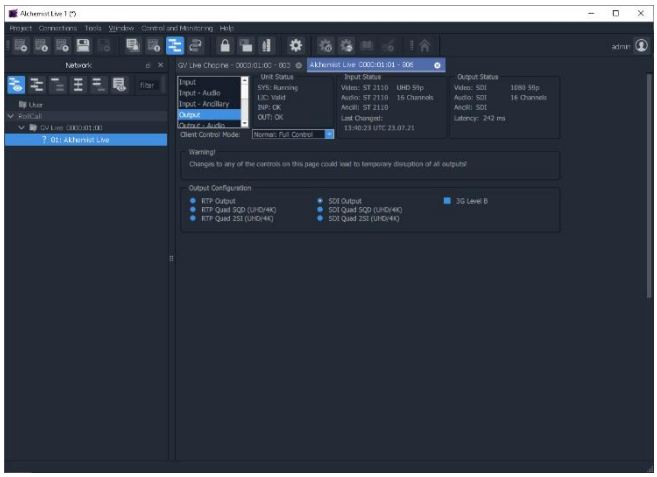
11. Click on the arrow adjacent to the GV Live to expand the tree.

    This will expose the Alchemist Live

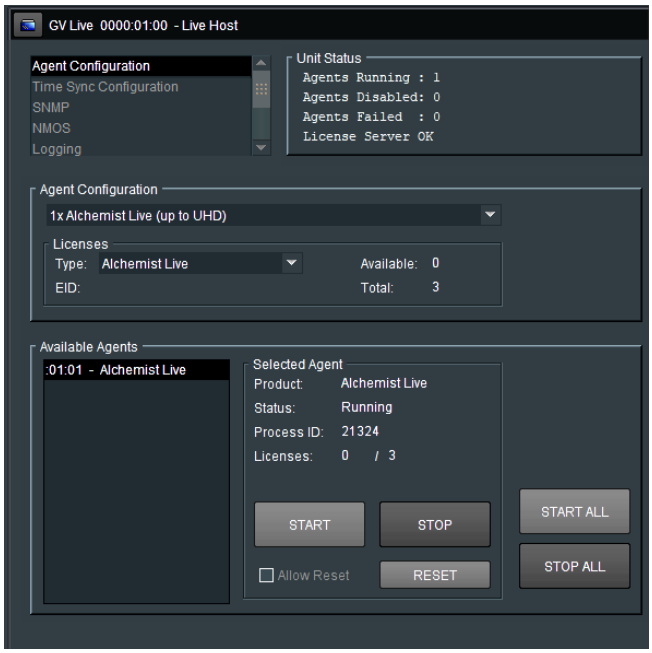


    Double click on the Alchemist Live to open the template.

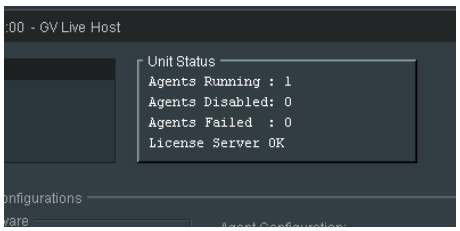


8. GV Live Template

8.1 Agent Configuration



Note that the Alchemist Live Agent will have started automatically, hence the **Unit Status** pane will show an Agent running:



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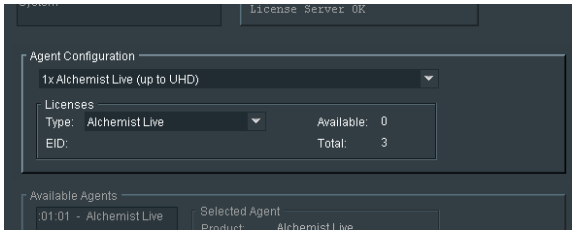
8.1.1 Agent Configuration

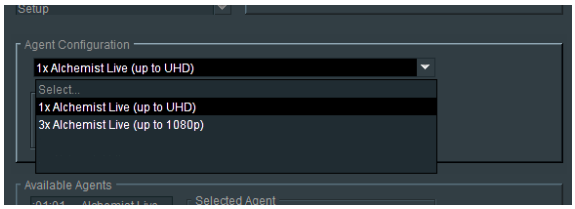


Agent Configuration

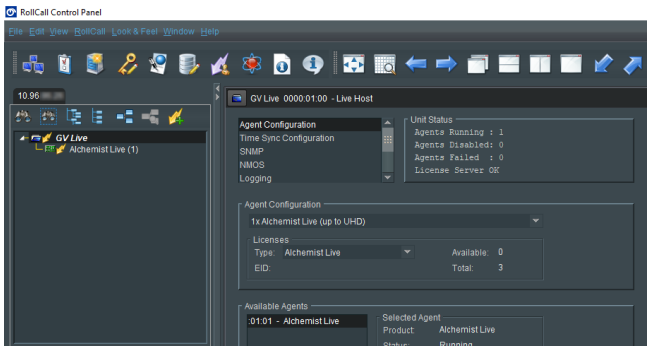
In the **Agent Configuration** pane, the Alchemist Live maybe configured to be:

- A single channel Alchemist Live supporting up to 4K conversion.
- A three channel Alchemist Live supporting up to 3G (no 4K).

Configuration is via a drop-down menu:

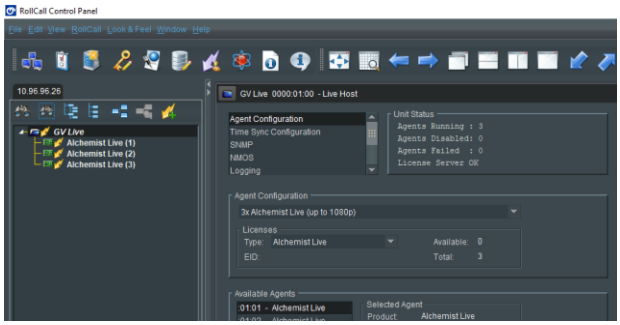


When configured as a single Alchemist Live supporting 4K conversion:



Note that only a single Alchemist Live is available in the connection pane.

When configured as 3x Alchemist Live supporting 3G conversion:



Note that 3x Alchemist Live are available in the connection pane.

Note: to reconfigure the Alchemist Live as a single 4K processor, or as a 3x 1080p (3G) processor, the Alchemist Live Agent(s) must first be stopped (see part 8.1.2 below).

Licenses

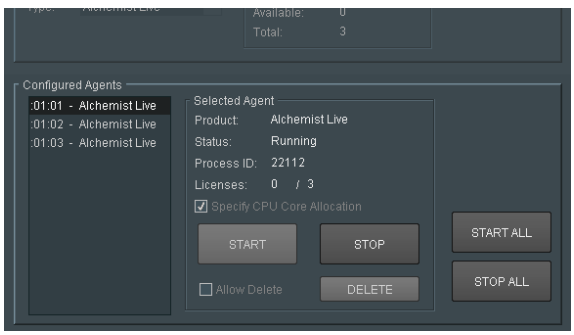
Licensing details are displayed within the **Available Agents** pane.

Note that an Alchemist Live installation will have a total of 3 licenses.

- 3 licenses are required for a single conversion process that includes a 4K resolution (either input or output).
- 3 licenses allow up to 3 independent conversion processes, each up to 1080p resolution (no 4K inputs or outputs configured).

8.1.2 Available Agents

In the **Available Agents** pane, confirmation that the Alchemist Live Agent is running is displayed:



Note: Alchemist Live Agents can be manually ***stopped*** and ***started*** from within the **Configured Agents** pane.

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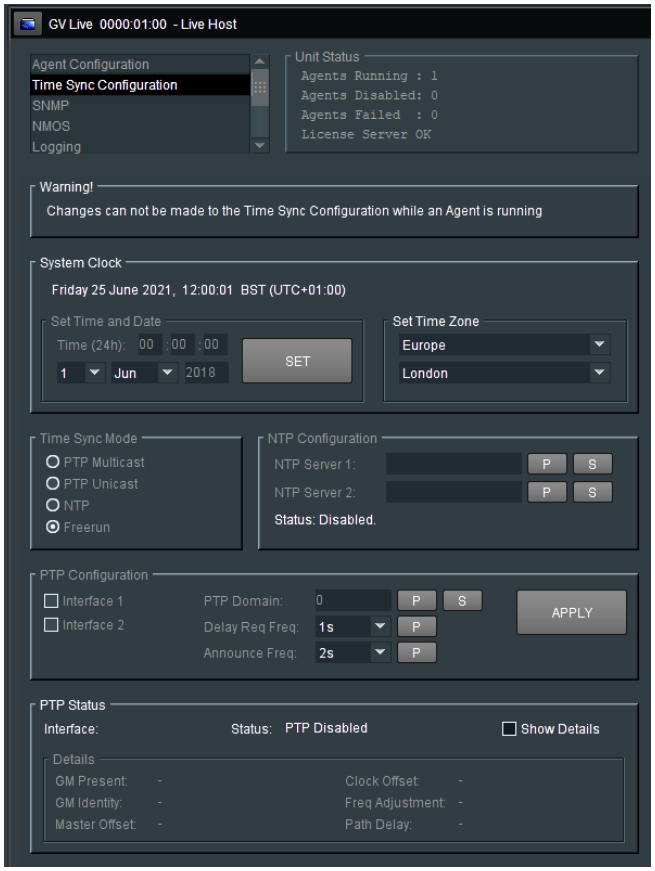
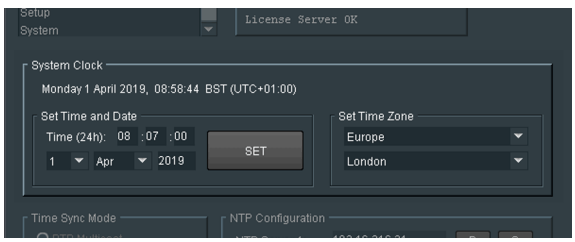
8.2 Time Sync Configuration



8.2.1 System Clock

In the **System Clock** pane, the **Set Time and Date** menu will only be active if the **Time Sync Mode** is set to **Freerun.**

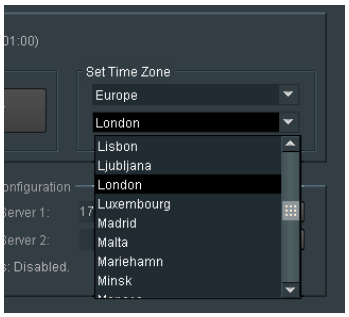


The time and date can be manually entered. Time to the nearest second can be configured and synchronised to an external clock by pressing **SET** at a precise moment.

Note – after each set of digits is entered, press ‘Return’ on the keyboard to make the setting permanent.

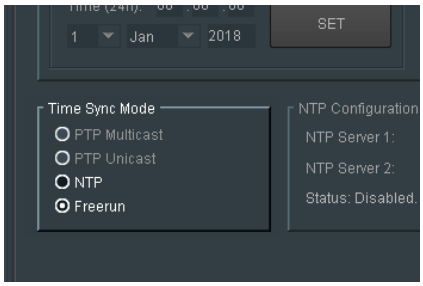
When **NTP** mode is selected, the time stamp will referenced to an external NTP server meaning that there is no requirement to set the system time.

Set Time Zone



The relevant Time Zone can be set using the drop-down menu.

Time Sync Mode

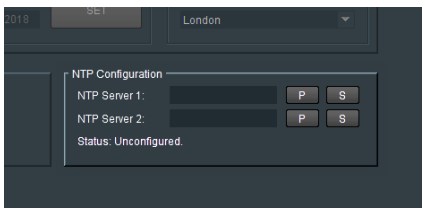


Four Time Sync modes are offered, however, at the time of writing the PTP modes are not yet available and these options are greyed out.

The Time Sync Mode can be set to be either:

- **PTP Multicast**
- **PTP Unicast**
- **NTP**
- **Freerun**

NTP Configuration



Here the NTP timestamp source can be defined. The IP Address of the primary NTP server can be entered and set by pressing ‘S’.

A secondary NTP Server can also be defined. Should something happen the Primary NTP Server making it unavailable, the Secondary NTP server will act as a backup.

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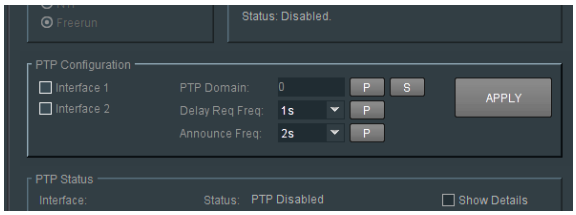
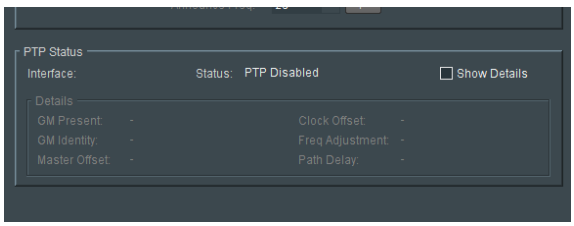
PTP Configuration



The **PTP Configuration** menu is really only relevant to Alchemist Live IP

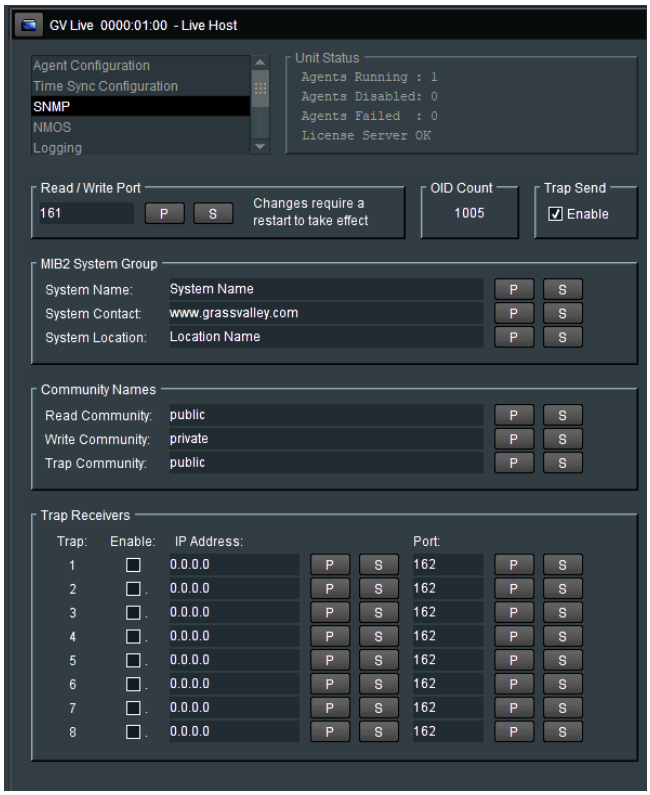
While it is possible to configure the **Time Sync Mode** to a PTP setting, this is somewhat irrelevant for the SDI variant of Alchemist Live and is not recommended.

PTP Status



The **PTP Status** menu is really only relevant to Alchemist Live IP and with regard to Alchemist Live SDI can be ignored.

8.3 SNMP

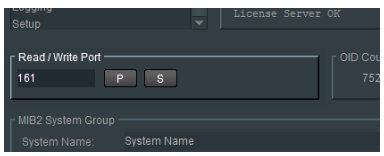


The SNMP feature associated with Alchemist Live conform to SNMP Version 2C

The SNMP feature allows the Alchemist Live system to be controlled via a universal SNMP Control Application.

Alchemist Live can also report its status to the SNMP Application, via SNMP traps. Traps may be sent to up to 8 receivers.

8.3.1 Read/Write Port



The default port for SNMP is: 161

Port number may be manually set by manually typing it in and selecting the **S** button.

Pressing the **P** button will return the port number to the default value.

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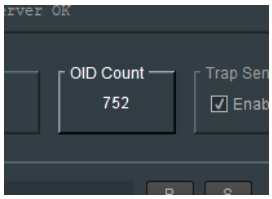
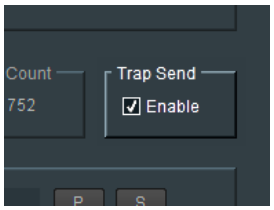
8.3.2 OID Count



The OID Count field reports the total number of active OID's configured.

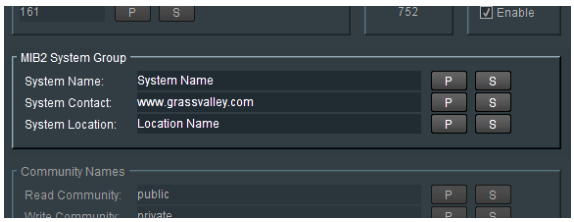
Note that the count will vary depending upon the Alchemist Live configuration.

8.3.3 Trap Send



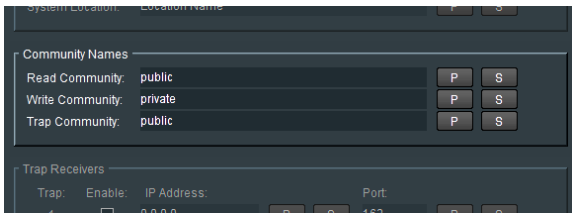
The sending of SNMP Traps can be enabled or disabled using the **Send Trap** control.

8.3.4 MIB2 System Group



User information used to easily identify a controlled device, in this case Alchemist Live, from the SNMP control application.

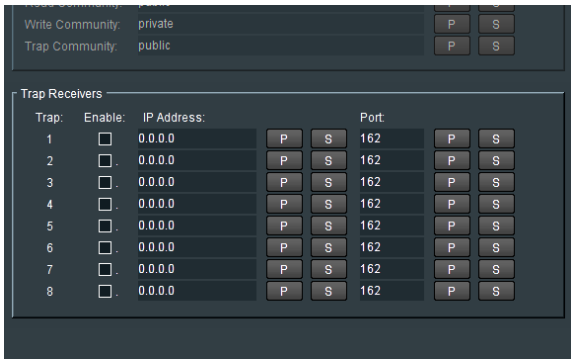
8.3.5 Community Names



SNMP mandates that the SNMP agents should accept request messages only if the community string in the message matches its community name. Therefore, the management application should always communicate with the agents along with the associated community name.

The default SNMP community names are "public" for read-only (GET) operations and "private" for read-write (SET) operations. The management applications should have provision to include the community names in its request messages.

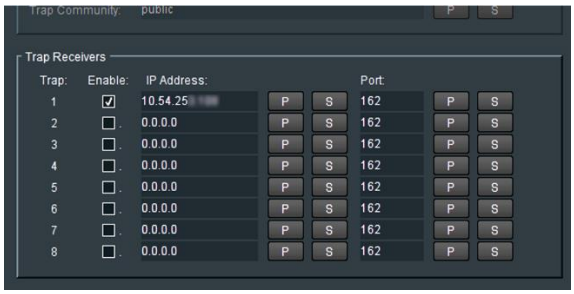
8.3.6 Trap Receivers



A Trap Receiver may be defined by its IP Address. Up to 8 receivers can be defined.

Specific Ports can be defined for each SNMP receiver.

In this example a single receiver has been configured:



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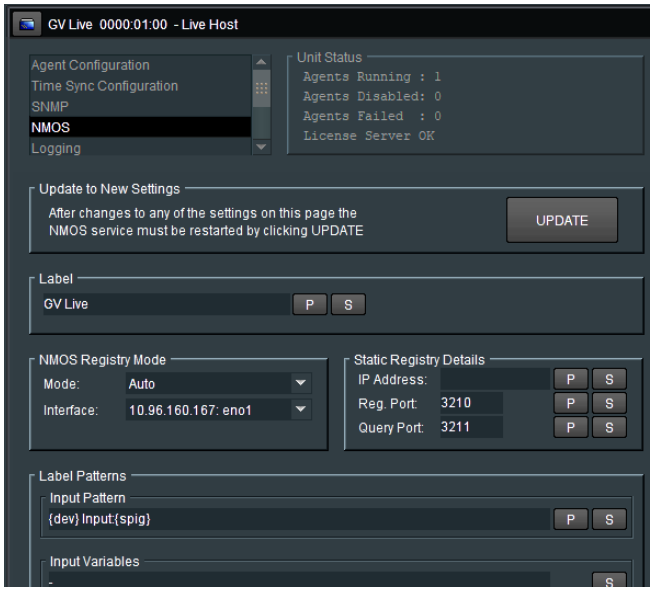
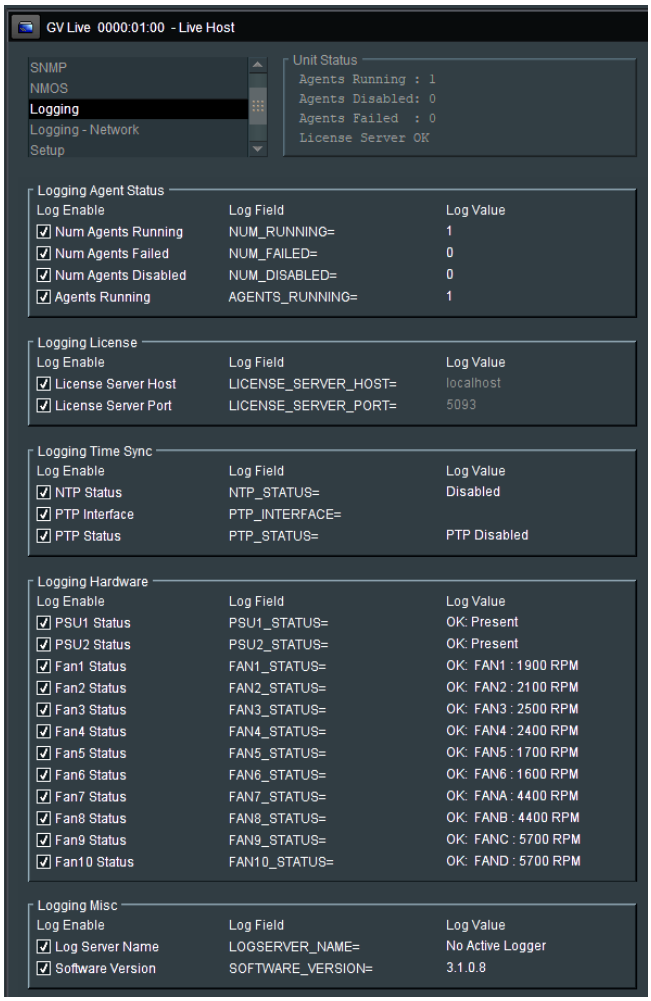
8.4 NMOS



The NMOS menu is only relevant to the IP variant of Alchemist Live. With regard to Alchemist Live SDI the NMOS menu may be ignored.

8.5 Logging



In the **Logging** window, Log fields maybe be disabled and enabled. Log fields are sent to the defined Log Server (see 8.7.5).

The **default** configuration is everything **enabled**.

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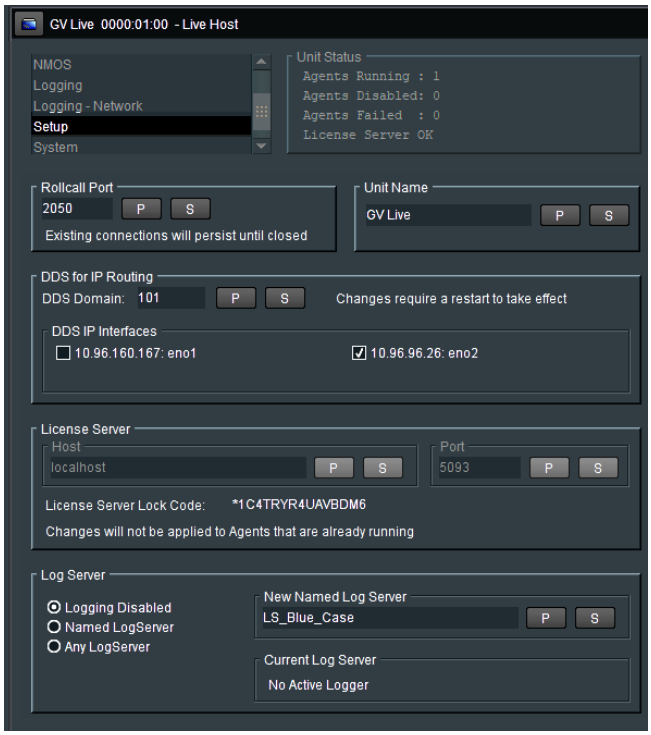
8.6 Logging-Network

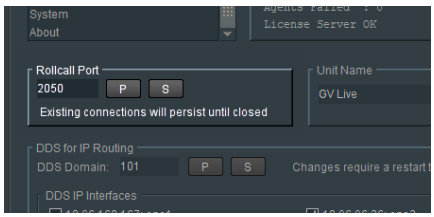
In the Logging window, Log fields specifically relevant to the Network Interfaces maybe be disabled and enabled. Log fields are sent to the defined Log Server (see 8.7.5).

The **default** configuration is everything **enabled**.

8.7 Setup



8.7.1 RollCall Port



The default **RollCall Port** is 2050.

In normal circumstances the **RollCall Port** is left in its default setting. However, an alternative RollCall port can be configure here, if required.

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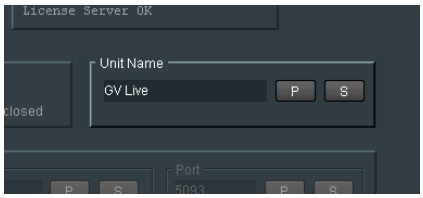
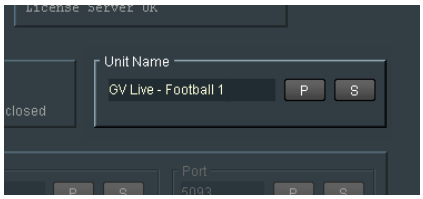
8.7.2 Unit Name



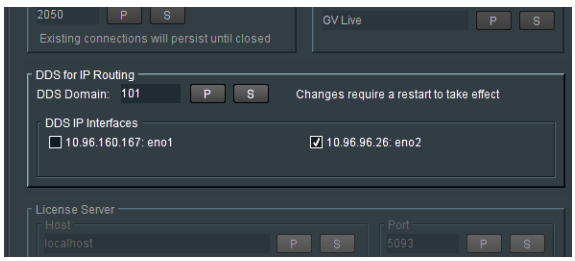
This is the identifying name of the GV Live product/unit/application. If several GV Live products are running, it may be desirable to give them individual names:

To edit the unit name, simply type the desired name in the box and press ‘S’ to *save.*



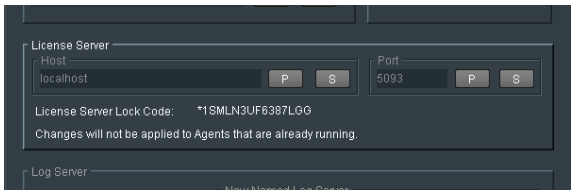
Pressing the ‘P’ button will return the name to its default setting: **GV Live**

8.7.3 DDS for IP Routing



The **DDS for IP Routing** menu is only relevant to Alchemist Live IP and with respect to Alchemist Live SDI may be ignored.

8.7.4 License Server



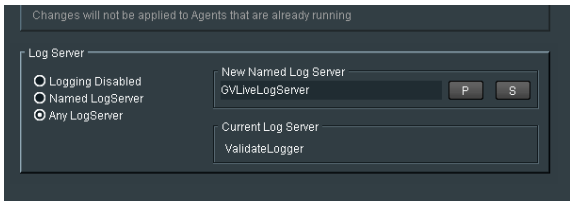
This field details the relevant License Server of the Alchemist Live. In normal circumstances the License Server runs on the Product/Turnkey host machine, hence the **Host** is defined as **Localhost.**

The default **Port** is 5093.

These items are fixed and cannot be changed.

Lock Code: The Alchemist Live license is locked to the hardware that the License Server is running on. The lock code is used to generate the license.

8.7.5 Log Server



Here the desired **Log Server** can be defined.

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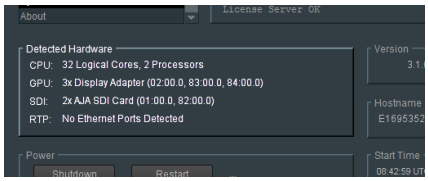
8.8 System

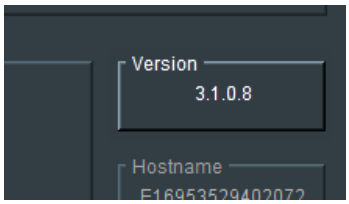
GV Live 0000:01:00 - Live Host
Logging
Logging - Network
Setup
System
About
Unit Status
Agents Running : 1
Agents Disabled: 0
Agents Failed : 0
License Server OK
Detected Hardware
CPU: 32 Logical Cores, 2 Processors
GPU: 3x Display Adapter (02:00.0, 83:00.0, 84:00.0)
SDI: 2x AJA SDI Card (01:00.0, 82:00.0)
RTP: No Ethernet Ports Detected
Version
3.1.0.8
Hostname
E16953529402072
Power
Shutdown
Restart
Start Time
08:42:59 UTC 23.06.21
Network Interfaces
eno2
Configuration changes require a restart to take effect
Configuration
Existing (Stored)
Static IP Address: -
Subnet Mask: -
Default Gateway: -
Mode: DHCP
State: ENABLED
New
DHCP
Enabled
APPLY
Current Status
IP Address: 10.96
Subnet Mask: 255.255.254.0
MAC Address: AC:1F:6B:99:9D:7B
Link Status: RUNNING
Switch Information (LLDP)
Name: -
Chassis ID: -
Port ID: -
Port VLAN: -
Hardware Monitoring
PSU Monitor
PSU 1
Name: PWS-2K04A-1R
S/N: P2K4ACH49KT2495
Status: OK: Present
PSU 2
Name: PWS-2K04A-1R
S/N: P2K4ACH49KT2498
Status: OK: Present
Fan Monitor
Fan 1: OK: FAN1 : 1600 RPM
Fan 2: OK: FAN2 : 1600 RPM
Fan 3: OK: FAN3 : 2500 RPM
Fan 4: OK: FAN4 : 2400 RPM
Fan 5: OK: FAN5 : 1500 RPM
Fan 6: OK: FAN6 : 1400 RPM
Fan 7: OK: FANA : 4400 RPM
Fan 8: OK: FANB : 4400 RPM
Fan 9: OK: FANC : 5700 RPM
Fan 10: OK: FAND : 5700 RPM
GPU Monitor
Show GPU Stats
GPU Driver Version: 460.80 . [1] . [1] . [1]
GPU Device 1
Temp: 58 C
Fan: 34 %
GPU Device 2
Temp: 24 C
Fan: 23 %
GPU Device 3
Temp: 19 C
Fan: 23 %
GPU Device 4
Temp: -
Fan: -

8.8.1 Detected Hardware



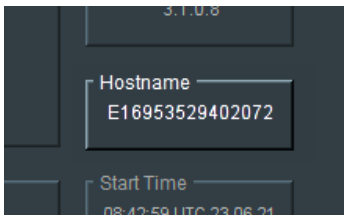
Displays detected hardware details of the GV Live Host system.

8.8.2 Version



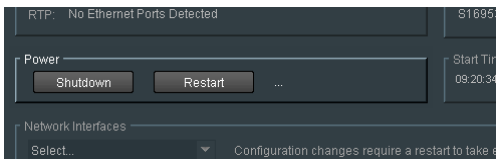
Reports the software version of the Alchemist Live.

8.8.3 Hostname



The host name of an Alchemist Live displays the Serial Number of the Server Enclosure.

8.8.4 Power



The **Shutdown** and **Restart** controls can be used to remotely either power-down, or power-cycle, the Alchemist Live Host Machine.

Note that if the Host machine is powered-down, the RollCall Template will close and it will not be possible to restart the system via RollCall.

Remote power-up is possible via the IPMI port (see **Appendix A**, below).

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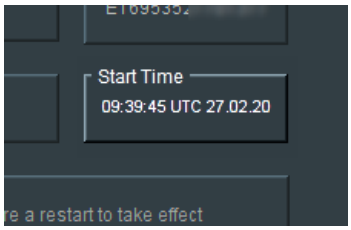
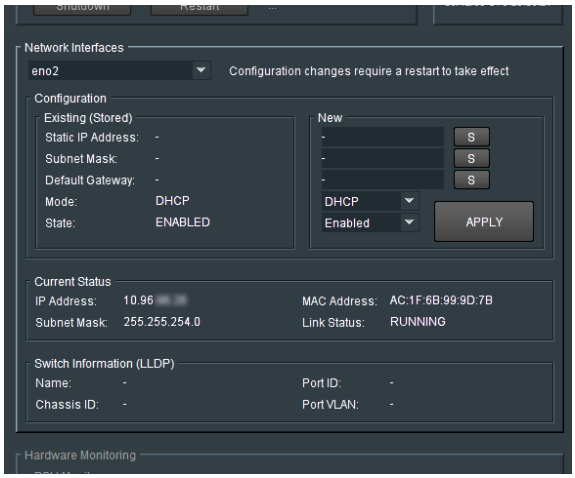
8.8.5 Start Time



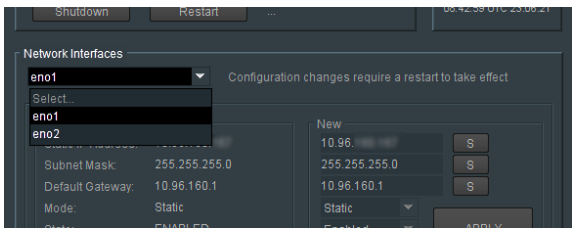
Reports the start time that the Alchemist Live system was last started up.

8.8.6 Network Interfaces



Here either of the two NIC's can be configured.

A particular NIC can be selected from the drop-down menu:

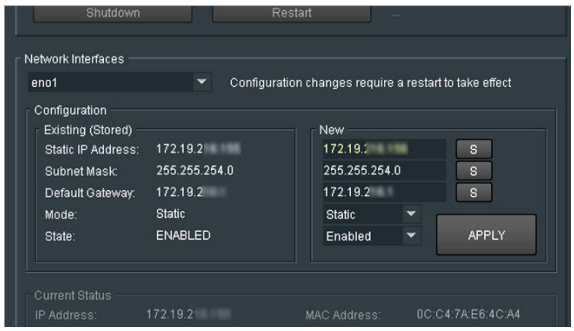


Note that, by definition, NIC **eno1** must be configured with a Static IP. It cannot be configured to be DHCP.

NIC **eno2** may be configured to be either Static, or DHCP.

Once the NIC has been selected, the current connection details, if configured, will be displayed in the Existing (Stored) field.

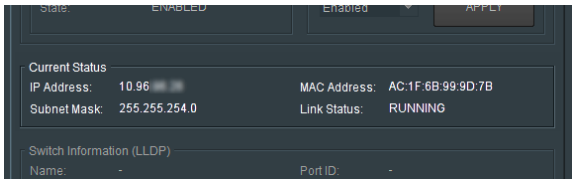
If a new connection is to be configured, the details should be entered in the **New** field:



Select **Apply** to make the changes permanent.

The changes to the Network configuration will only be adopted once the Agent is restarted.

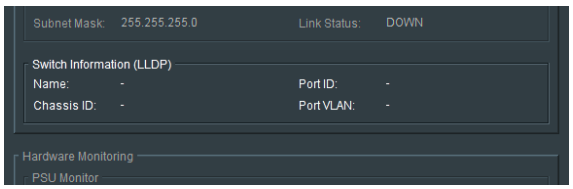
Current Status



This field will display the status of the current NIC selected above.

Conformation of the IP current connection, the **MAC Address** and **Link Status** are displayed in the Current Status field.

8.8.7 Switch Information (LLDP)



The **Switch Information (LLDP)** menu is only relevant to Alchemist Live IP and can be ignored.

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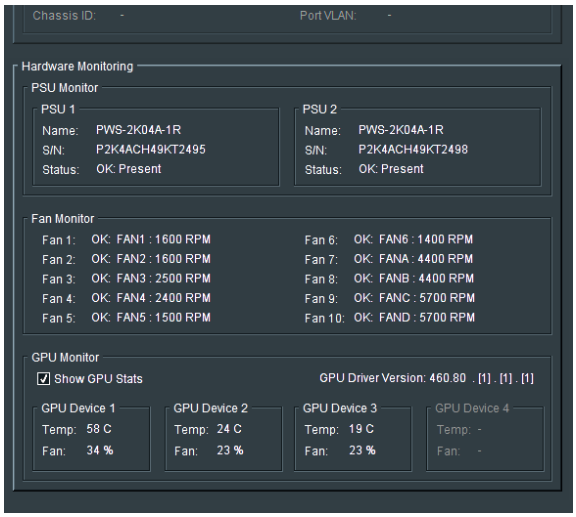
8.8.8 Hardware Monitoring

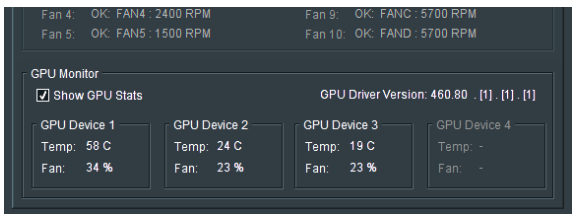


The Alchemist Live Hardware Monitoring feature constantly monitors the Host hardware.

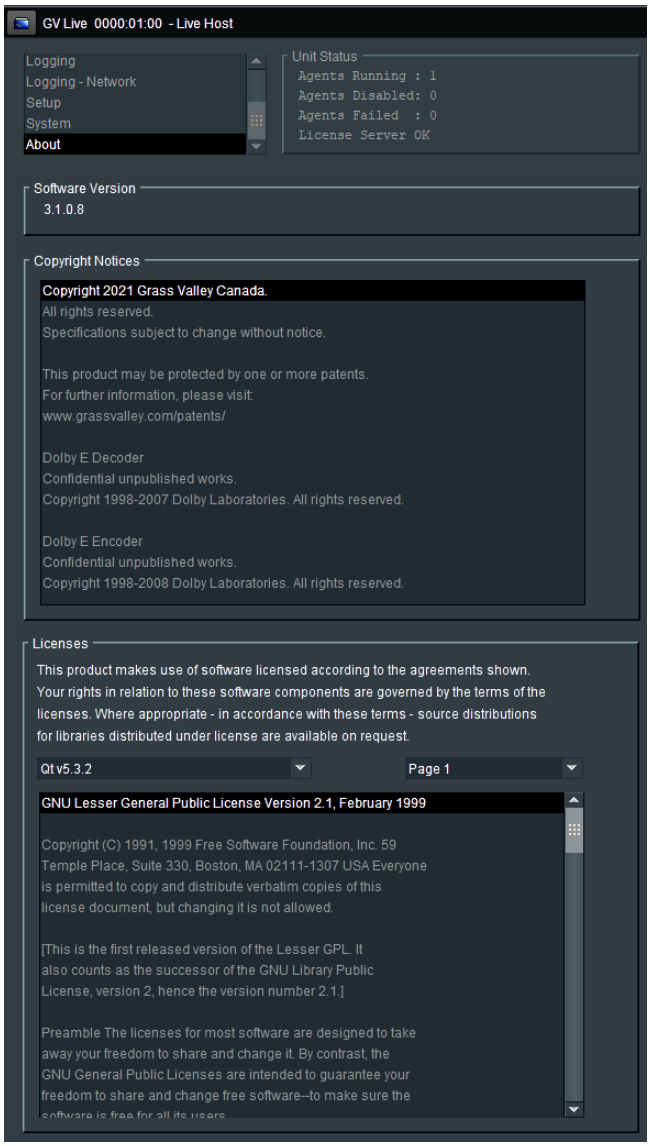
Hardware Monitoring reports the state of:

- PSU (x2)
- Fans (x10)
- GPU (x3)

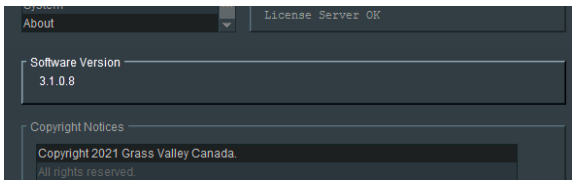
When **Show GPU Stats** is checked, the temperature and fan status will be displayed for each installed GPU:



8.9 About

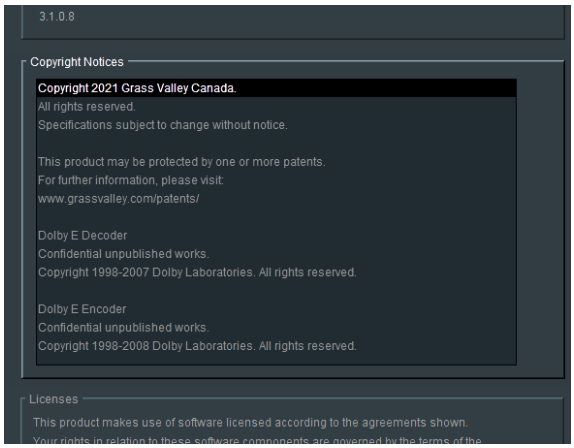


8.9.1 Software Version



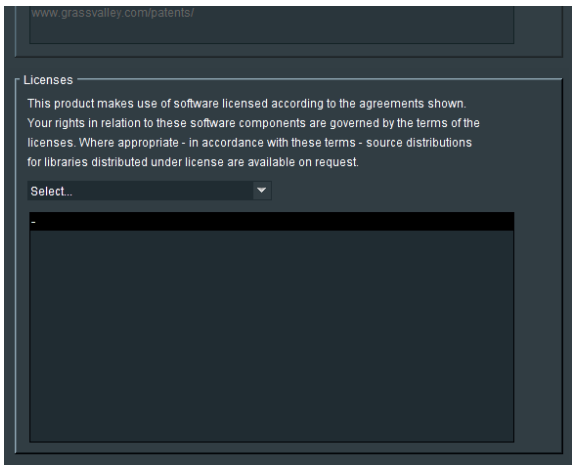
Reports the installed version of Alchemist Live code.

8.9.2 Copyright Notice



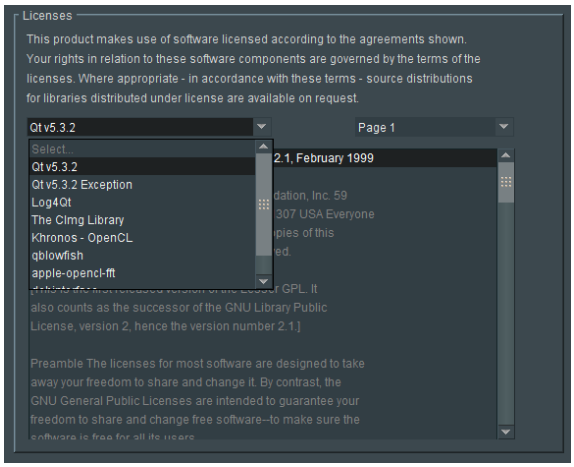
Reports Copyright information.

8.9.3 Licenses

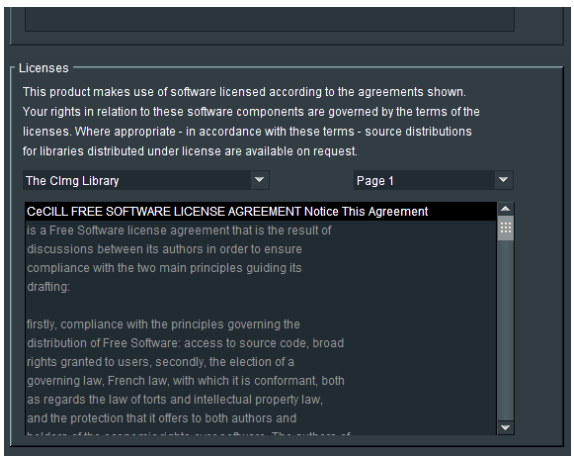


Reports information pertaining to third party licensing associated with Alchemist Live.

Specific licensing can be selected from a drop-down menu:



Once selected, specific license information will appear below.



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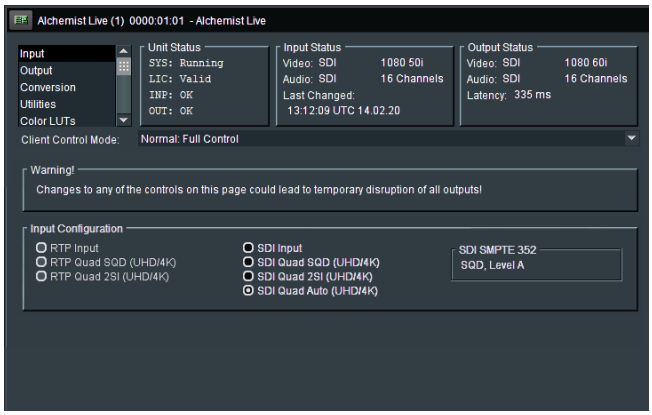
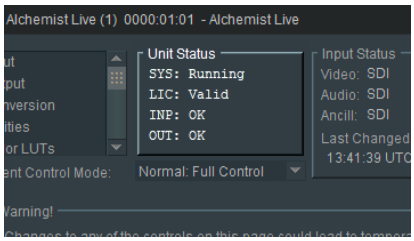
9. Configuring Alchemist Live



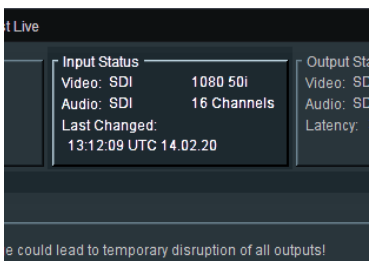
9.1 Unit status



Here confirmation is given that the:

- System **(SYS)** is running.
- License **(LIC)** is valid
- Input **(INP)** is valid
- Output **(OUT)** is valid

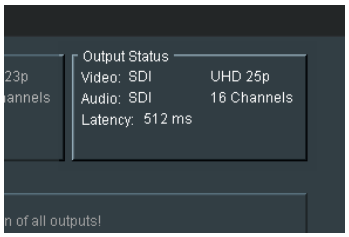
9.2 Input status



Here Video and Audio sources are confirmed.

The input video standard is reported. In this example the input is reported to: 1080/50i with 16 channels of audio.

9.3 Output Status

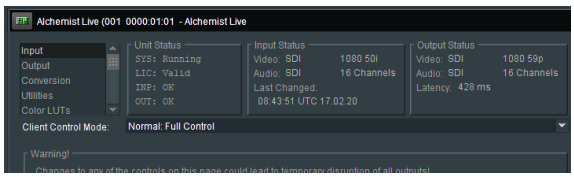


Here the configured output video format and standard are confirmed.

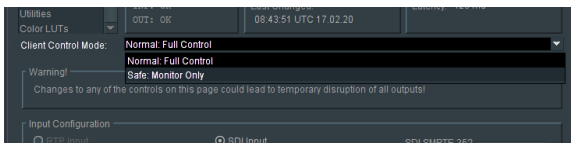
The number of output audio channels is confirmed.

The system latency is reported in terms of *ms*.

9.4 Client Control Mode



The Client Control Mode has two possible settings, selectable from a drop-down menu:



Normal Mode: Full control via the RollCall enabled.

Safe: Monitor Only: Control via the RollCall inhibited, but template can be viewed

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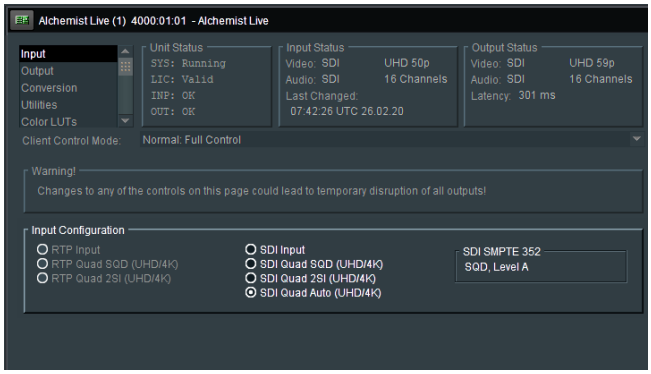
9.5 Input



9.5.1 Input Configuration: SDI Input / SDI Quad SQD / SDI Quad 2SI / SDI Quad Auto

The input format is selected in the **Input Configuration** field.

Note – Alchemist Live SDI supports SDI inputs. Alchemist Live IP supports RTP input transport streams.

There are four possible settings to choose from:

- SDI Input
- SDI Quad SQD (UHD/4K)
- SDI Quad 2SI (UHD/4K)
- SDI Quad Auto (UHD/4K)

SDI Input:

Should be selected when the applied input is SD, HD, or 3G.

SDI Quad SQD (UHD/4K):

This setting may be selected when the input is Quad Square Division.

SDI Quad 2SI (UHD/4K):

This setting may be selected when the input is Quad 2 Sample Interleave.

SDI Quad Auto (UHD/4K):

If the input is either Quad Square Division, or Quad 2 Sample Interleave, the Alchemist Live will automatically detect which version of Quad Link is present at the input.

Note that if the input is low frame rate UHD (30 fps or less), the **Auto** mode is not appropriate. The associated metadata does not discern between Square Division and 2SI, as it does for high frame rate.

When in **Auto** mode, the input will be assumed to be Square Division.

In circumstances where the applied input is low frame rate, UHD Quad 2SI, the Input Configuration should be configured as:

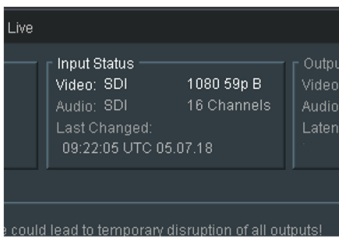
- SDI Quad 2SI (UHD/4K)

SDI SMPTE 352

The **SDI SMPTE 352** confirms the Quad Link standard detected.

3G Input

3G inputs may either Level A, or Level B. Detection is automatic and no configuration is required. When Level B is detected, confirmation will be displayed in the **Input Status** field.



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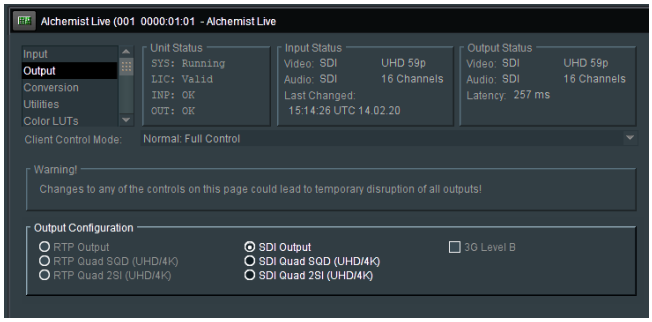
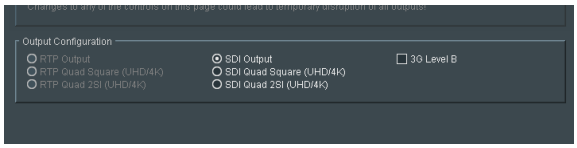
9.6 Output



9.6.1 Output Configuration: SDI Input / SDI Quad Link

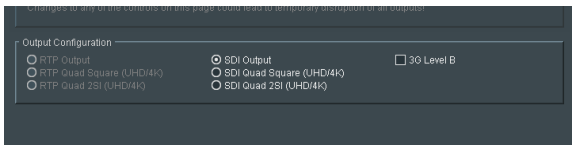


The output format is selected in the **Output Configuration** field.

Note: Alchemist Live SDI only supports SDI outputs. Alchemist Live IP supports RTP output transport streams, hence the RTP controls are greyed out (not available) for the SDI variant.

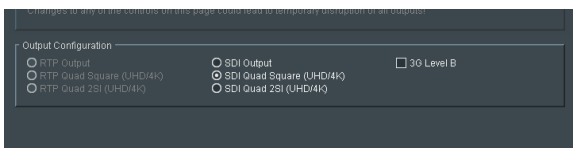
SDI Output:

When the required output is SD, HD or 3G, **SDI Output** should be selected.



In circumstances when the output is configured to be 3G, the output by default is 3G Level A. 3G Level B may be configured by checking the **3G Level B** checkbox.

UHD/4K SDI outputs may be configured to be either, **SDI Quad Link (UHD/4K)** or **SDI 2SI (UHD/4K)**.



9.7 Conversion

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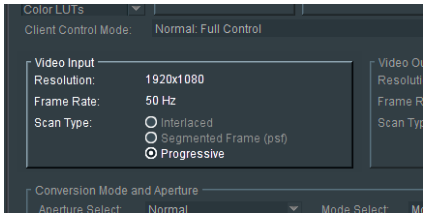
9.7.1 Video Input: Interlaced / Segmented Frame (psf) / Progressive



Alchemist Live relies on automatic standards detection of the incoming source signal.

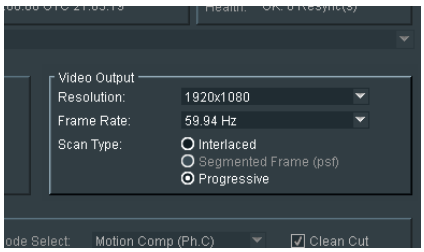
This field reports the detected input video format.

- When Progressive inputs are detected, the **Progressive** input flag will be set and the **Interlaced** and **Segmented Frame (psf)** flags will be greyed out (not available).
- When an interlaced input is detected, it will be assumed that the incoming signal is true high frame rate, and the **Interlaced** flag will be set.

If the input is actually **psf**, it will be detected as true high frame rate content. For example, if the input is **1080 25psf**, Alchemist Live will detect the input as **1080 50i** (since the video transport is the same for both). Therefore, in such a scenario, it is important that the **psf** input flag is manually selected.

Note - for optimal conversion performance of psf sources, it is important that the input is identified as psf and not processed as true high frame rate interlaced input.

9.7.2 Video Output: Interlaced / PsF / Progressive

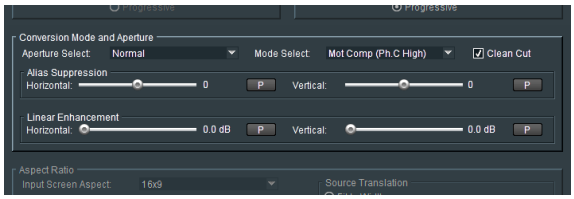


Note that the options offered in the **Video Output** pane will depend on the settings of the **Output Configuration** tab (see paragraph 9.6.1 above).

In the **Video Output** field, the output video format can be defined in terms of **Resolution, Frame Rate** and **Scan Rate**.

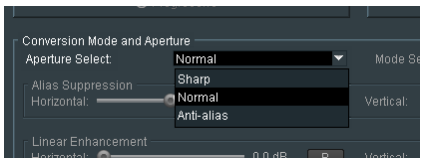
When the output is configured to be **UHD/4K,** the options: **Interlaced**, and **Segmented Frame (psf)** will be greyed out (not available).

9.7.3 Conversion Mode and Aperture



Aperture Select: Sharp / Normal / Anti-alias

This control can be used to set the appropriate conversion aperture.



Available settings are **Sharp, Normal** & **Anti-alias**. The default setting is **Normal**.

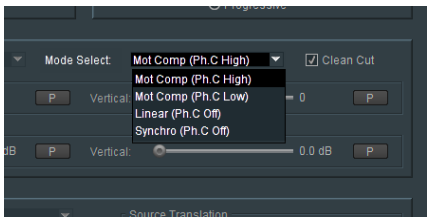
Sharp preserves the most vertical resolution from the input picture.

Normal provides the best compromise for typical input pictures.

Anti-alias is designed to prevent objectionable aliases in the output pictures. Aliasing refers to an artefact associated with sampled signals. This undesirable effect is caused by sampling frequencies being too low to faithfully reproduce the frequencies present in the original source. Such artefacts are usually associate with a down-conversion process i.e HD to SD.

Mode Select: Motion Comp (Ph.C), Linear (Ph.C Off), Synchro (Ph.C Off)

This control is used to set the conversion mode.



Three modes of operation are available:

- Motion Comp (Ph.C High)
- Motion Comp (Ph.C Low)
- Linear (Ph.C off)
- Synchro (Ph.C off)

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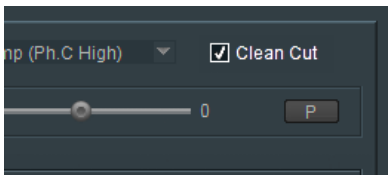
Motion Comp (Ph.C)	is the default and applies Motion Compensated Interpolation when converting from one frame rate to another. As the name suggests, Motion Comp (Ph.C High) performs the highest quality motion compensation conversion.
Motion Comp (Ph.C Low)	is a less aggressive form of PhC motion compensation. In circumstances were Ph.C High may introduce unacceptable conversion artefacts associated with certain source content. Examples may include: ▪ burnt in captions over complex moving content ▪ object periodics ▪ fixed transparent logos or captions over complex moving content ▪ scrolling captions over complex moving content
Linear (Ph.C off)	disables the Motion Compensation, and employs a linear interpolation when converting from one frame rate to another.
Synchro (Ph.C off)	converts from one frame rate to another, by dropping or repeating input pictures as required. Depending on the conversion requested, field or frame based synchronise events could occur.

Clean Cut

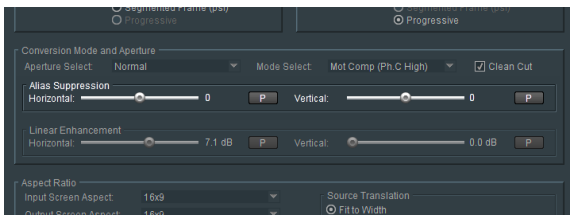


This control allows the User to configure the **Clean Cut** feature to be either enabled or disabled.

Default setting is: **Enabled**

Alias Suppression: Horizontal / Vertical

The **Alias Suppression** feature allows the User to manually increase, or decrease, the magnitude of alias suppression. Separate horizontal and vertical controls are available.



Two slider controls are offered. Default setting is zero.

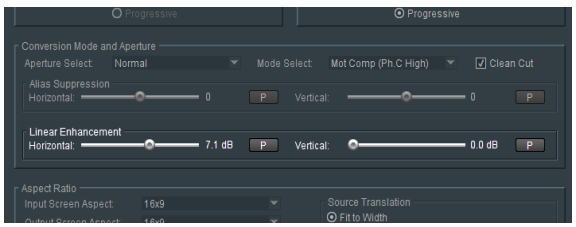
Positive settings increase alias suppression.

Negative settings decrease suppression.

Alias suppression should be used to balance perceived resolution against unwanted aliasing.

Linear Enhancement

The **Linear Enhancer** feature allows the User to increased perceived sharpness. Separate horizontal and vertical controls are available.



Note that the effectiveness of the **Linear Enhancer** is affected by the chosen settings of the **Alias Suppression** controls.

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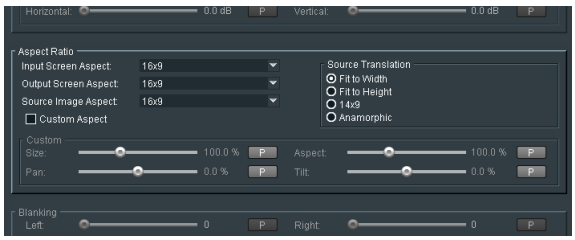
9.7.4 Aspect Ratio

The user can specify aspect ratio translations using either the drop down menus or the custom settings.



ARC controls include:

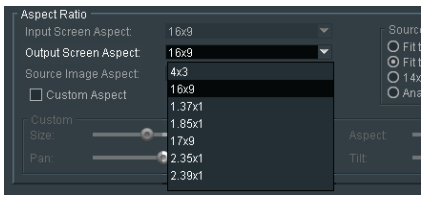
- **Input screen aspect**
- **Output screen aspect**
- **Source image aspect**
- **Source translation** (to output)

Input Screen Aspect

Input Screen Aspect is used to describe the source screen input aspect ratio by selecting the relevant setting from the drop down list:

Output Screen Aspect

Output Screen Aspect is used to describe the output screen aspect ratio from the drop down list.

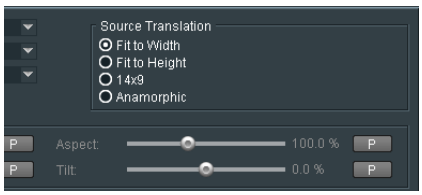


Source Image Aspect

The **Source Image Aspect** control is used to define the aspect ratio of the active image within the input screen aspect.

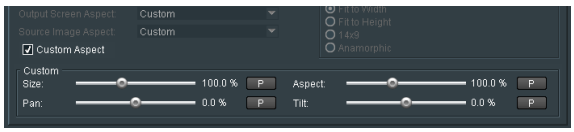
Source Translation

The **Source Translation** control is used to describe the translation required from source to output image.



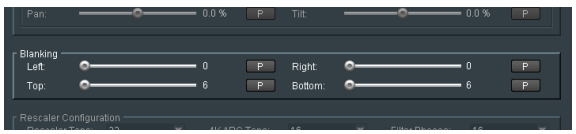
Custom Aspect

The **Custom** controls can be enabled to activate the custom display setting sliders, using the **Custom Aspect** checkbox.



The controls: **Size**, **Pan**, **Asp** and **Tilt** can now be used set any desired **display** settings.

9.7.5 Blanking: Left / Right / Top / Bottom



The **Blanking** slider controls allow the User to blank areas of the output image. Blanked areas will appear black in the output image.

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9.7.6 Ph.C Protect Areas

The **Ph.C Protect Areas** feature allows up to three separate areas of the processed picture to be excluded from the Ph.C process. Fixed objects like Logos or static text will be protected from motion prediction artefacts that can be associated with Ph.C frame rate conversion.

Protect Area 1, 2, & 3

Each of the three areas can be configured as a rectangle, which will be defined by the four controls:

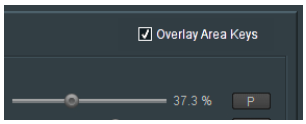
- Left,
- Right
- Top
- Bottom

The feature can be enabled using **Enabled** button:

Note that:

- The **Right** control must be a higher percentage setting than the **Left** control.
- The **Bottom** control must be a higher percentage setting than the **Top** control.

Overlay Area Keys

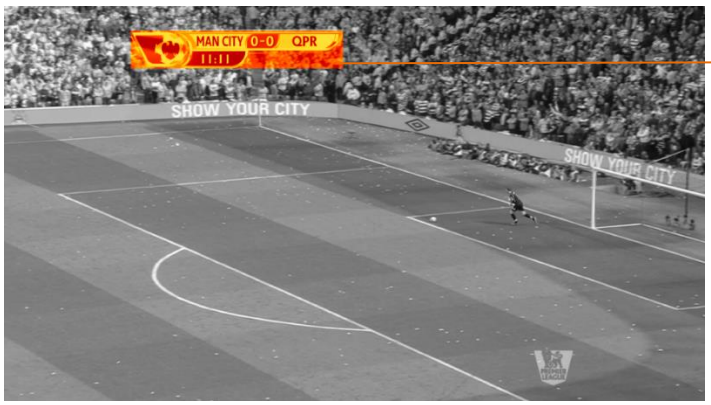


When enabled the defined areas of the configured keys will be shown on the output video picture.

- Ph.C active areas will be detailed by areas shown in monochrome.
- Non-Ph.C areas (where linear conversion will take place) will be detailed by areas shown in red.

Each Key will describe a rectangular protected area.

In the following example, a single protected area is defined by the key: **Protected Area 1**



Defined PhC inactive areas

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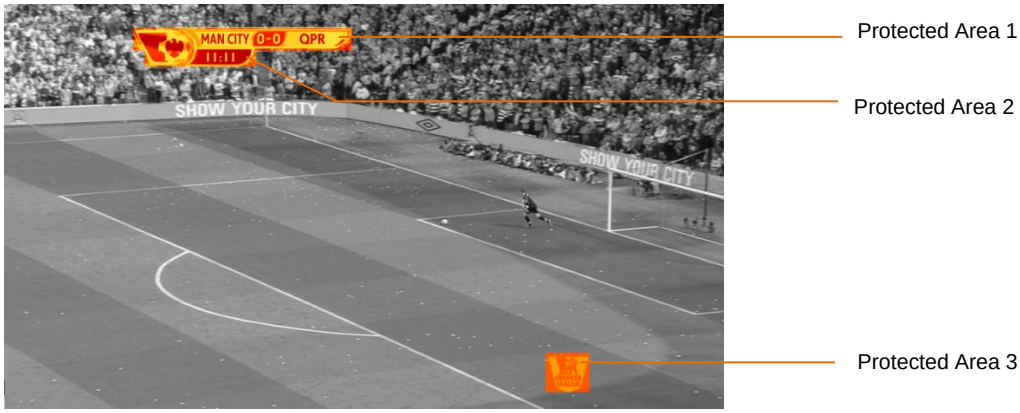
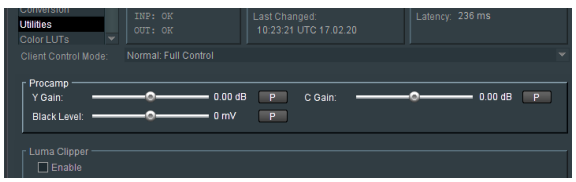
Multiple keys can be configured to create more complex shapes, or to protect multiple objects:



9.8 Utilities

9.8.1 Proc Amp: Y Gain / C Gain / Black Level



- The luminance gain may be adjusted using the slider control **Y Gain.** The range is +/- 6dB.
- The chrominance gain may be adjusted using the slider control **C Gain**. The range is +/- 6dB.
- The black level may be adjusted using the slider control **Black Level.** The range is +/- 80mV.

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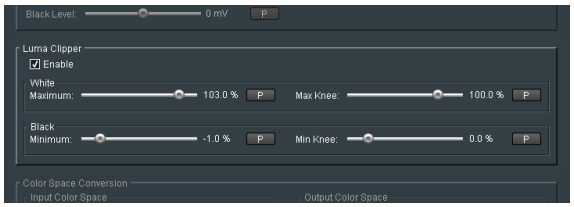
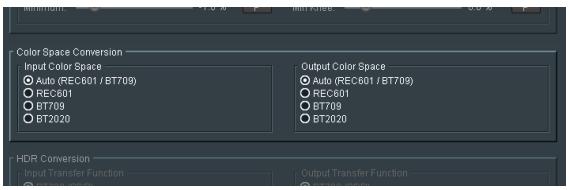
9.8.2 Luma Clipper: White Max / White Knee / Black Min / Black Knee



The **Luma Clipper** feature is enabled with the tick box. Note that the default setting is *disabled.*

When **Enabled,** the controls: **White Maximum**, **White Knee**, **Black Minimum** and **Black Knee** all become active and may be configured.

9.8.3 Color Space Conversion: Auto / REC601 / BT709 / BT2020

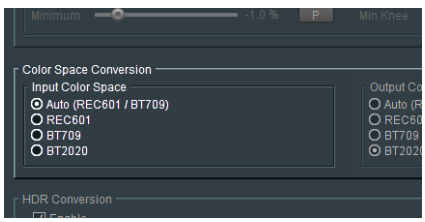


Input Color Space

In **Auto** mode, if the input is:

- SD, it will be assumed that the source complies with REC601.
- HD, it will be assumed that the source complies with BT709.
- UHD/4K, it will be assumed that the source complies with BT709.

The User can manually force the desired **Input Color Space** setting. This is important when inputting sources compliant to BT2020, as currently there is no automatic signalling present in the SDI.

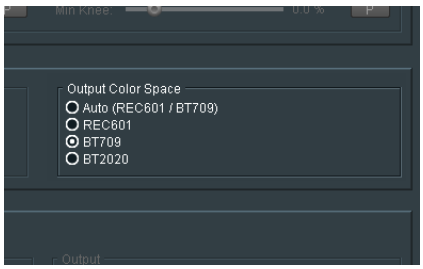


Output Color Space

In **Auto** mode, if the output is:

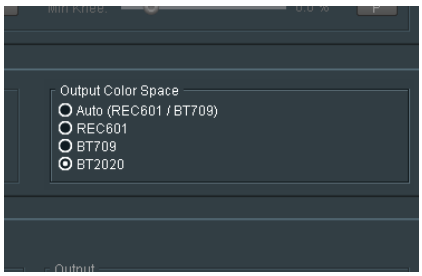
- SD, it will comply with REC601.
- HD, it will comply with BT709.
- UHD/4K, it will comply with BT709.

The User may choose to manually force the desired **Output Color Space** setting.



If it is desired that the output be BT2020, then the control should be set to:

- BT2020



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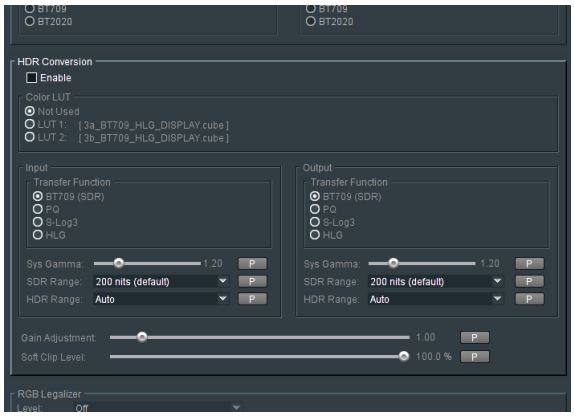
9.8.4 HDR Conversion



Alchemist Live supports HDR processing.

Supported transfer functions are:

- BT709 (SDR)
- PQ
- S-Log 3
- HLG
- Custom LUTs

Note: although HDR10 doesn't appear in the menu, HDR10 employs the same HDR curve as PQ, hence HDR10 content can be processed by configuring as PQ.

Alchemist Live supports the following conversion modes:

- Retention of SDR
- Conversion from HDR to SDR
- Conversion from SDR to HDR
- Retention of HDR
- Translation of HDR

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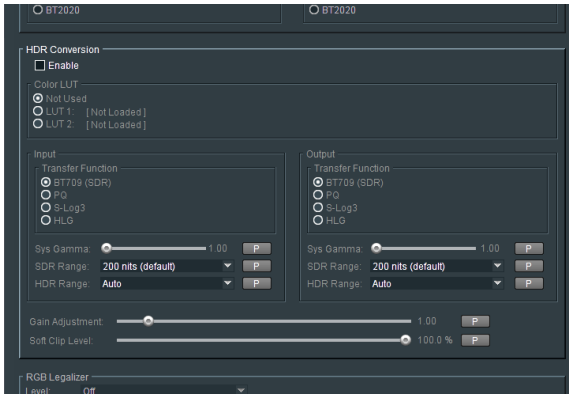
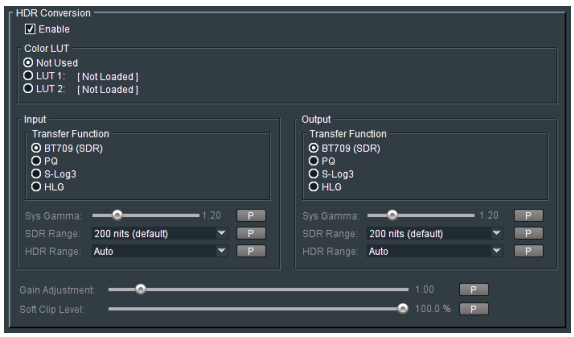
Enable

Note that in its default state, the **HDR Conversion** menu is disabled.



To make the controls active, it is first necessary to configure the checkbox: **Enable**



Once enabled, the relevant HDR menu can be manually configured.

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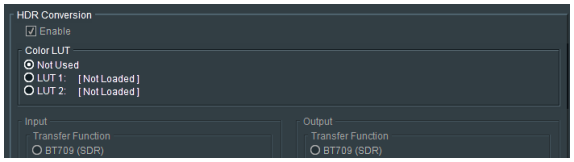
Color LUT



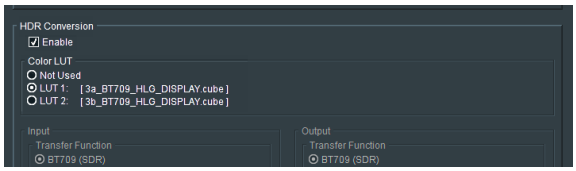
Introduced in V2.1.0.20 Alchemist Live supports Custom LUTs (Look Up Tables).

LUT files should be in the form of *.cube*

The procedure of loading LUTs into the Alchemist Live system is described in the Color LUTs menu described in Section 3 below.

A LUT will describe the overall characteristic from input to output.

The LUT will take priority over the setting of **Input Transfer Function** and **Output Transfer Function.**

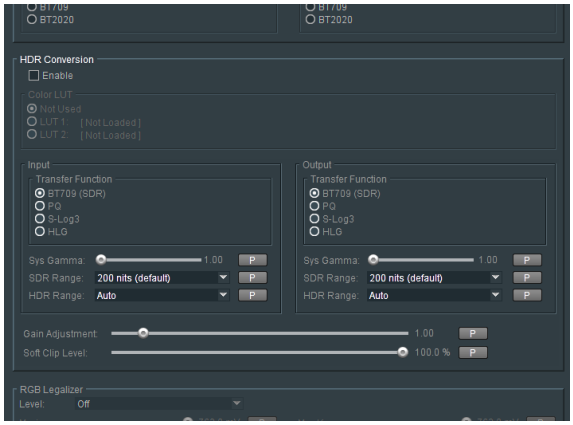


Up to two LUTs can be loaded at a time. Either LUT can be easily applied to a particular conversion process.

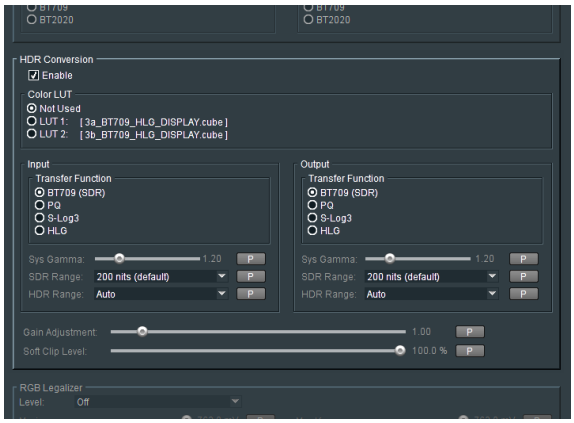
Alchemist Live can store many LUTs, but only two may be loaded into the LUT Cache (in the Color LUT menu) at a time.

SDR / HDR Translation

Note that in its default state, the **HDR Conversion** menu will be greyed out (unavailable).

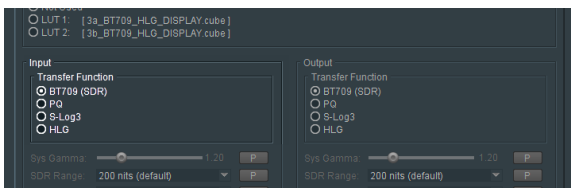


To make the controls active it is first necessary to configure the checkbox: **Enable**



Once enabled, the **HDR Conversion** menu will be active and maybe configured.

Input Transform Function



The **Input** control allows the Operator to define the input with respect to HDR.
If an SDR to HDR process is to be configured, the input should be defined as: **BT709 (SDR).**

The default setting is: **BT709 (SDR)**

Note that if a custom LUT is active, that the Transfer Function menu will be disabled

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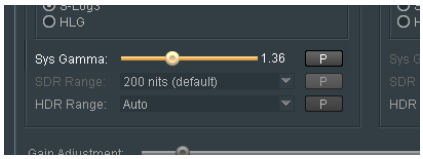
System Gamma (Input)



This control is only active when the input HDR standard is defined to be either HLG or S-Log3.

It is not relevant for inputs that conform to PQ, or SDR formats and the control will be greyed out.

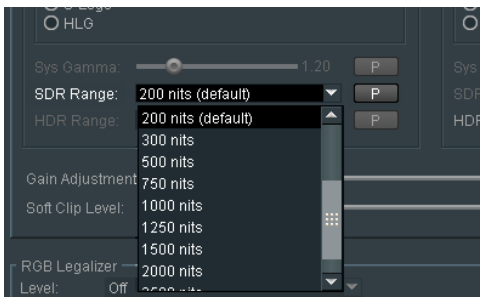
When active, **Input System Gamma** may be defined to a value between 1.0 and 2.0.

The default setting is: 1.2

Note – this is an input control and defines the brightness of the HDR input. A higher setting will result in a darker output picture.

System gamma is implemented in accordance with ITU-R Recommendation BT.2100

SDR Range (input)



This control is only active when the conversion mode is SDR to HDR. The control is used to define how bright the SDR input is.

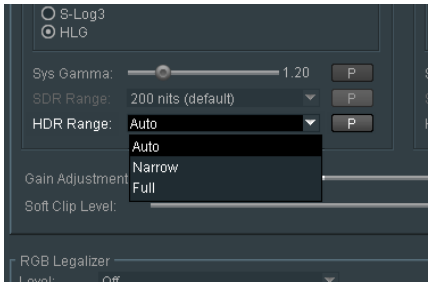
The desired setting can be configured using the drop-down menu.

The range of the control is: 20 to 3000 nits.

The default value is: 200 nits

Note - The higher the nit level set, the brighter the output picture will be.

HDR Range (input)



This control is only active when the input is defined to be HDR compliant. The HDR Range may be set to **Auto**, **Full** or **Narrow**, using the drop down menu.

In **Auto** mode outputs compliant to:

- PQ will be set to **Full**
- HLG will be set to **Narrow**
- S-Log3 will be set to **Narrow**

When set to **Full,** sub-blacks and super-white luminance values are included.

When set to **Narrow,** sub-blacks and super-whites are clipped.

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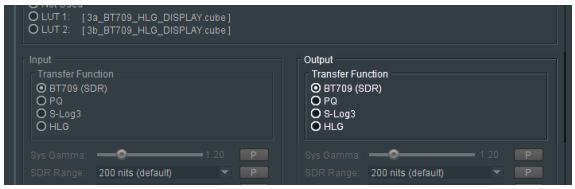
Output Transform Function



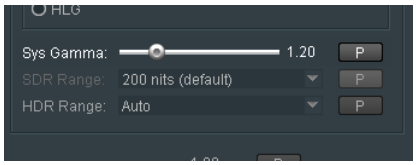
The output control allows the Operator to define the output with respect to HDR.

If an HDR to SDR process is to be configured, the output should be defined as: **BT709 (SDR).**

The default setting is**: BT709 (SDR)**

Note - that if it is a requirement that the output conform to HDR10, the output should be set to PQ. PQ and HDR10 employ the same HDR curve so setting PQ will effectively make the output compliant to HDR10

System Gamma (output)



This control is only active when the Output HDR standard is defined to be either HLG or S-Log3.

It is not relevant for outputs that conform to PQ, or SDR formats and the control will be greyed out.

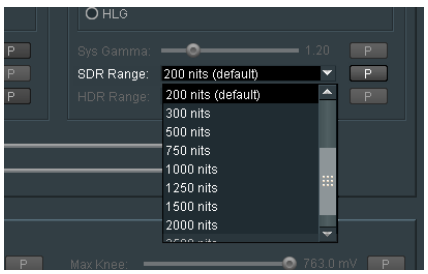
When active, Output System Gamma may be defined to a value between 1.0 and 2.0.

The default setting is: 1.2

Note – this is an output control and a higher setting will result in a brighter output picture.

System gamma is implemented in accordance with ITU-R Recommendation BT.2100

SDR Range (output)



This control is only active when the conversion mode is HDR to SDR. The control is used to define the SDR brightness of the output.

The range of the control is: 20 to 3000 nits.

The default value is: 200 nits

Note - somewhat unintuitively, the higher the nit level set, the darker the output picture will be.

HDR Range (output)

This control is only active when the output is defined to be HDR compliant. The HDR Range may be set to **Auto**, **Full** or **Narrow**, using the drop down menu.

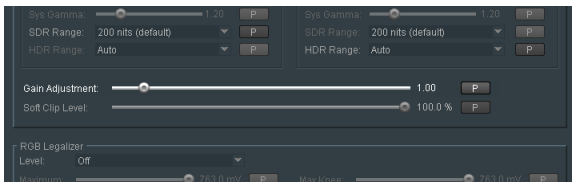
In **Auto** mode outputs compliant to:

- PQ will be set to **Full**
- HLG will be set to **Narrow**
- S-Log3 will be set to **Narrow**

When set to **Full,** sub-blacks and super-white luminance values are included.

When set to **Narrow,** sub-blacks and super-whites are clipped.

Gain Adjustment



This control allow the User to adjust the brightness of the output picture.

The control scale is 0.1 to 10.00

Default value is 1.00

Setting a higher value will make the output picture brighter.

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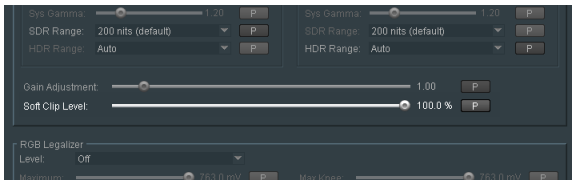
Soft Clip Level:



The control scale is 60 to 100%

Default value is dependent upon the conversion being performed:

If the process is:

- SDR to HDR, the default values is: 100%
- HDR to SDR, the default values is: 80%
- HDR to HDR, the default values is: 100%

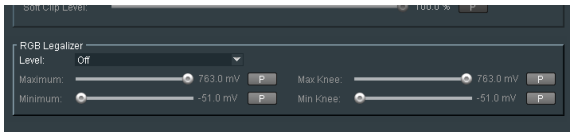
Note: if the conversion mode configured is: BT709 (SDR) to BT709 (SDR), these controls will be unavailable (greyed out).

The effect of this control is to ‘clip-off’ peak white video levels.

The White Clip control is used to increase detail in the high luminance areas of picture. This maybe important when there are high luminance levels in the source:

9.8.5 RGB Legalizer: Off / 700mV / 721mV / 735mV / Custom

The default setting of the RGB Legalizer is: **Off**



Three preset settings are offered for the RGB Legalizer **Level** control: 700mV, 721mV or 735mV. These can be selected using the drop-down menu.

Alternatively, a **Custom** setting can be configured. When set to **Custom,** the custom controls become active allowing the User to set any combination of values:

Note: an expanded description of the RGB Legaliser is offered in Appendix E below.

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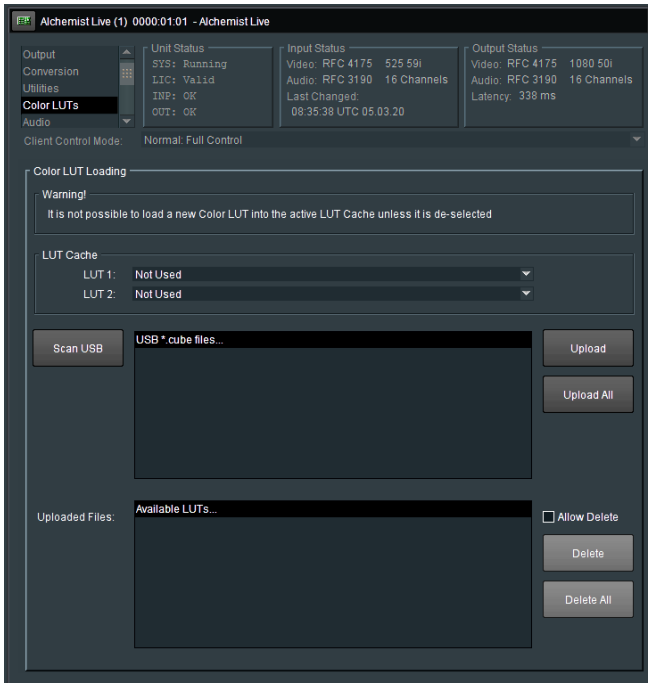
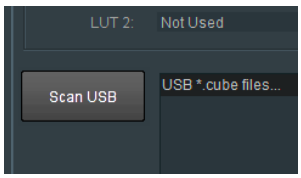
9.9 Color LUTs



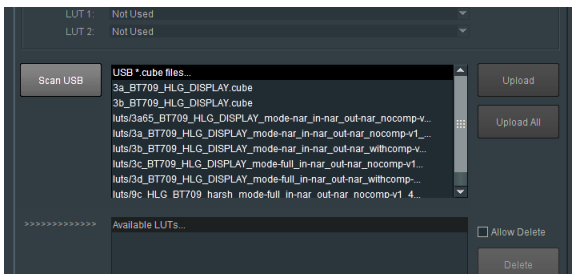
The **Color LUTs** menu is used to load LUTs.

LUTs tables in the form of a *.cube* file, are loaded from an inserted USB Drive.

Scan USB



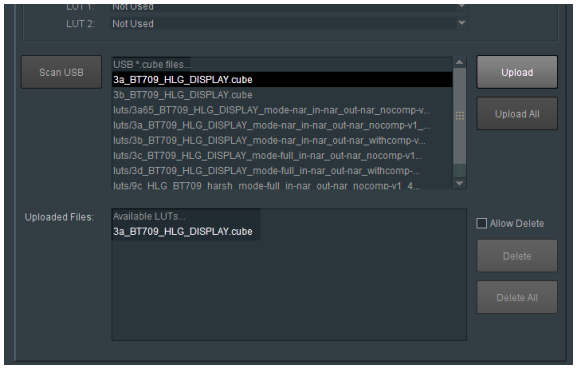
When pressed, the inserted USB Drive will be scanned. Any LUTs tables in the form of *.cube* files, will appear in the **USB *.cube files…** field:



A LUT may be selected in the **USB *.cube files…** field.

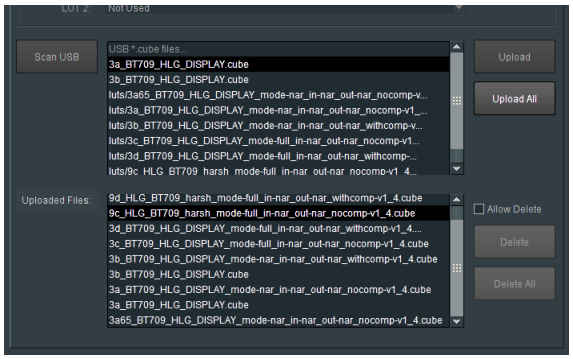
Upload

Pressing the **Upload** button will result in the selected LUT appearing in the **Available LUTs** field.



Upload All

Pressing the **Upload All** button will result in all the available LUTs appearing in the **Available LUTs** field.



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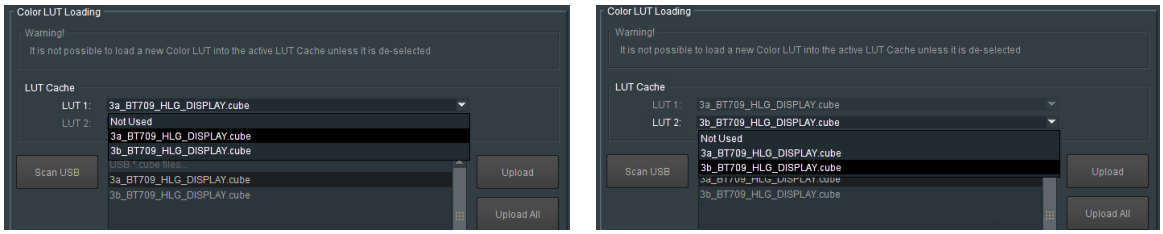
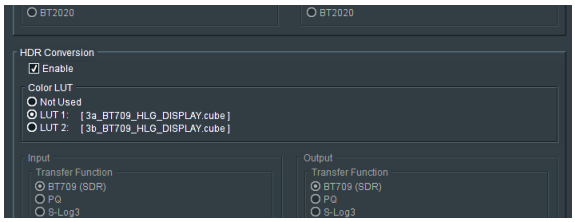
LUT 1 Cache / LUT 2 Cache

A LUT may be assigned to either the **LUT 1 Cache** or **LUT 2 Cache**, using the associated drop down menu:



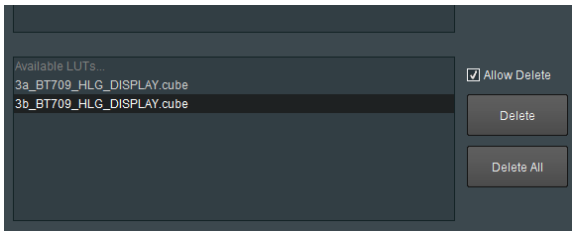
Note: the same LUT cannot be loaded into both LUT 1 Cache or LUT 2 Cache at the same time.

The LUT may be applied to a conversion by selecting it in the **Utilities/HDR** menu:

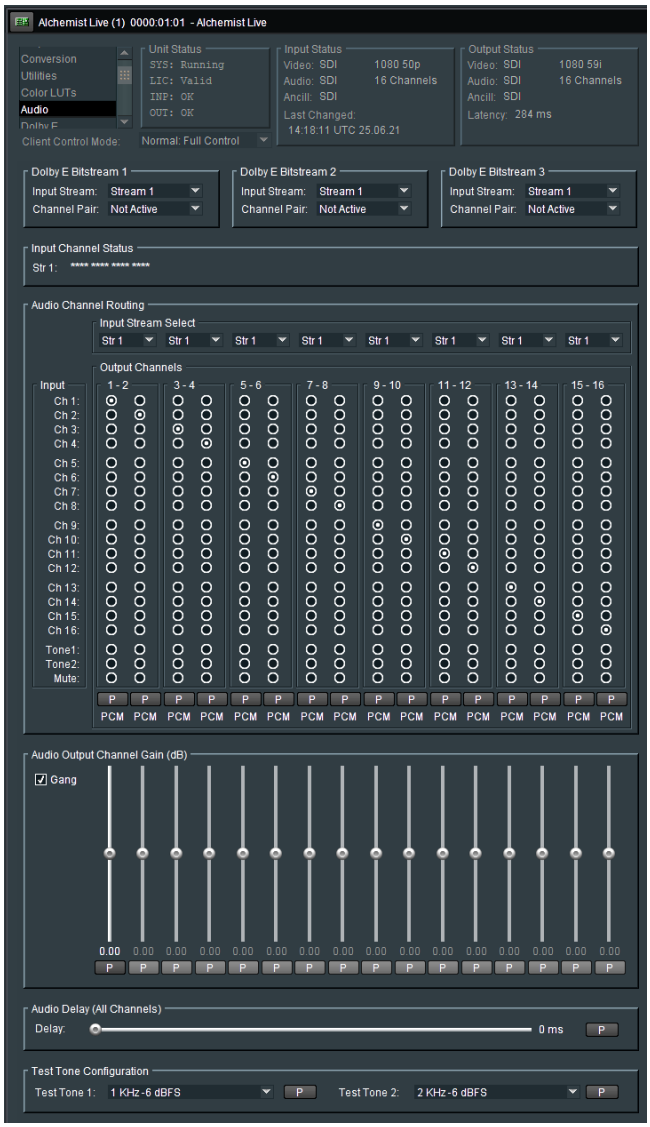


Delete

LUTs maybe deleted from the Available LUTs field, by first selecting the LUT to be deleted, then checking the **Allow Delete** box and then pressing the **Delete** button:



9.10 Audio



The SDI version of Alchemist-Live supports 16 channels of audio.

Audio features include:

- Audio Routing
- Audio Gain
- Audio Delay
- Tone Generation
- Dolby E Transcode (licensed option)

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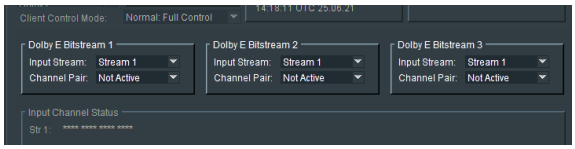
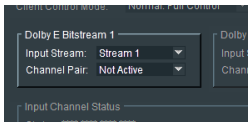
9.10.1 Dolby® E Stream Select *



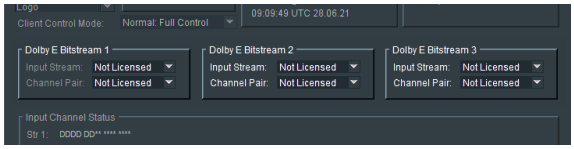
With the Alchemist Live in single channel mode, up to three channels of Dolby E may be transcoded.

Input Stream



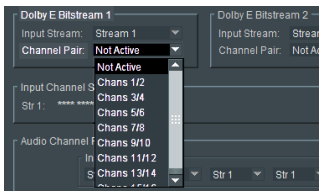
The **Input Stream** select control is only applicable to the Alchemist Live IP variant. With regard to Alchemist Live SDI, the control should be left as: **Stream 1**

Note: Licenses need to be applied to the specific Agent, as described in the **Setup** section; see 9.20.5 below. Should licenses not be available, or not applied, **Not Licensed** will be indicated:

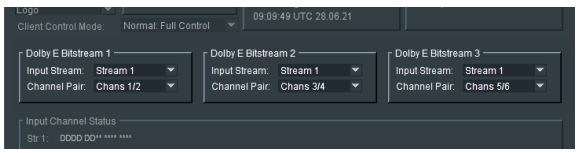


Channel Pair

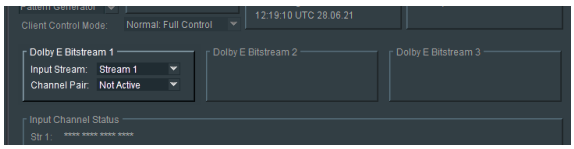
The input audio pair that the Dolby E is associated with, can be defined using the drop-down menu:



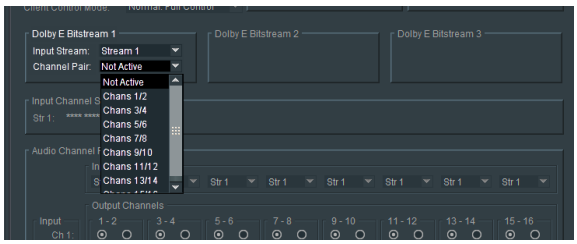
Up to three input audio streams can be defined:



If Alchemist Live is configured to be a three channel system, each channel can be configured to transcode a single Dolby E audio channel.



The input audio pair that the Dolby E is associated with, can be defined using the drop-down menu:



**Dolby is a registered trademark of Dolby Laboratories.*

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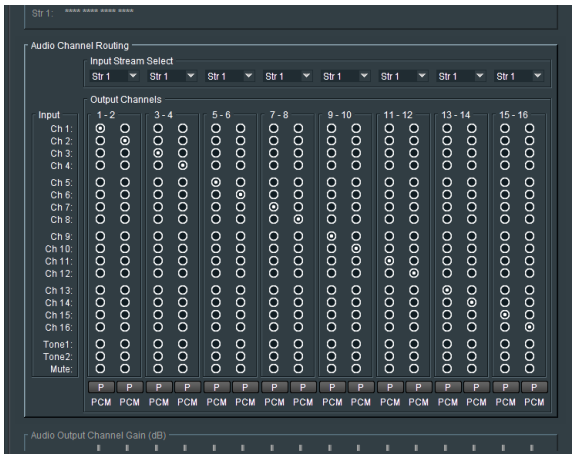
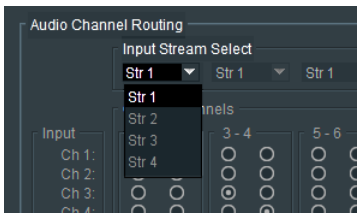
9.10.2 Audio Channel Routing



Input Stream Select

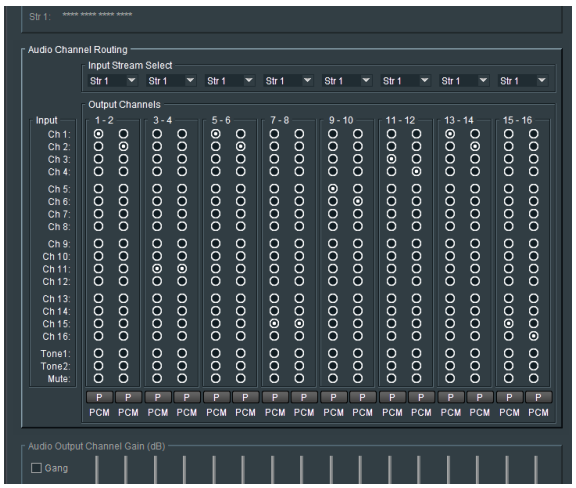
The Input Stream Select menu is only applicable to the Alchemist Live IP variant, and with regard to the Alchemist Live SDI, can be ignored.

Although the dropdown menu can be viewed, all options will be unavailable (grey'd out).



Audio Routing Matrix

The **Audio Channel Routing** matrix allows routing of any input audio channel, to any output audio channel:

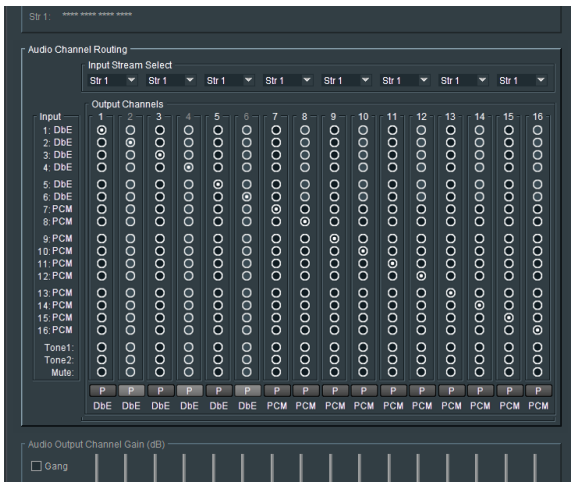


Example of a custom audio routing configuration

Each Audio route can be set to its default setting by pressing the associated ‘P’ (preset) button.

If the Dolby E option is available, where an incoming pair is carrying a Dolby E audio stream has been configured, the **Input** field will confirm the configuration.

Similarly, an output audio pair whose routed input is a Dolby E audio stream, will be identified as such in the **Output Channels** field:



Note: Dolby E sources can only be only be routed as an ‘audio pair’, hence the second routing column is greyed out as channel routing is not applicable.

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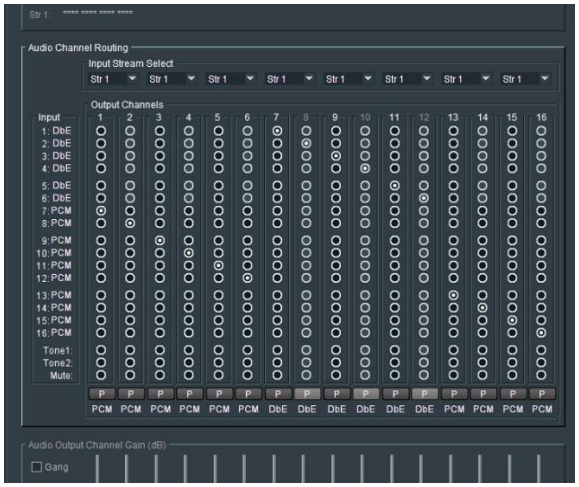
The following custom routing example includes Dolby E sources:



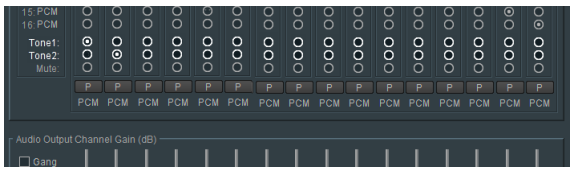
Note:

When a Dolby E is applied to an input that has been configured to accept a Dolby E input, and hence is licensed, then the input will be identified as “DbE”.

If a Dolby E bitstream is applied to an input that has not been configured as Dolby E and is hence not licensed, then the audio pair will be identified as “N”

Tone Generator

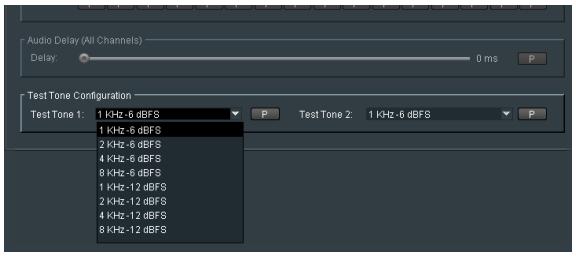
Alchemist Live has two tone generators. Each output audio channel can be configured to be either tone:



In this example:

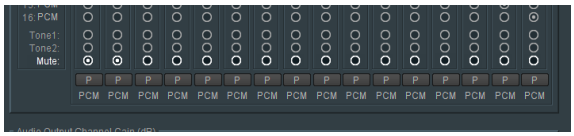
- output audio channel 1 has been configured to be **Tone1**
- output audio channel 2 has been configured to be **Tone2**

The tones generated by **Tone1** and **Tone2** can be configured in the **Test Tone Configuration** field:



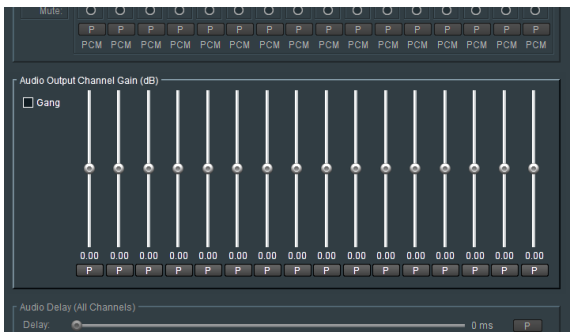
Tones may be configured with various frequencies and levels.

Mute

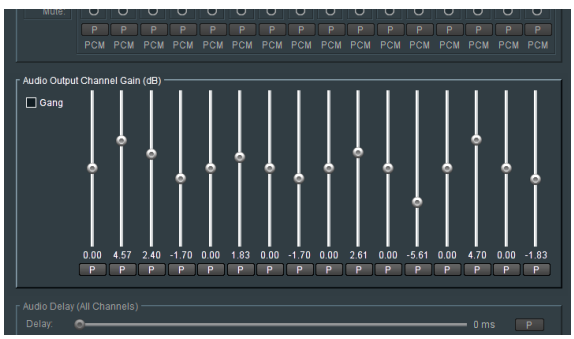


Any audio channel can be *muted* by selecting the appropriate check box.

9.10.3 Audio Output Channel Gain (dB)



Each audio output channel has its own associated gain control slider, meaning each output audio channel can be configured with a specific audio gain.



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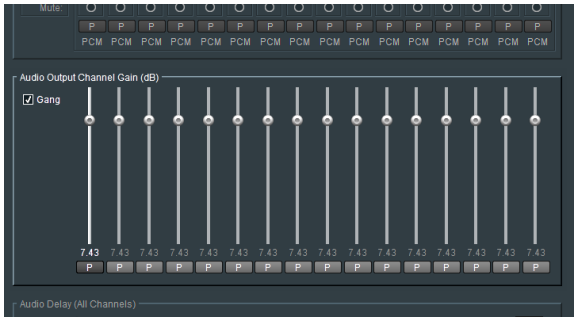
Alternatively, the gain controls can be ‘ganged’ enabling a global gain setting to be applied:



Each channel has an associated preset button **P.** When selected, the audio gain will return to unity.

9.10.4 Audio Delay (All Channels)

The **Delay** control allows a global delay to be applied to all audio channels. The control will delay audio relative to video.

The delay may be configured between 0ms to 500ms.

Default setting is: 0ms

Pressing the preset button **P** will apply the default setting.

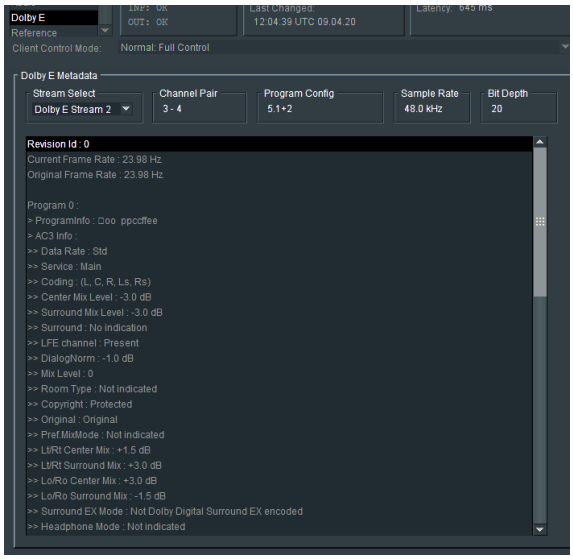
9.11 Dolby E

Dolby E Metadata

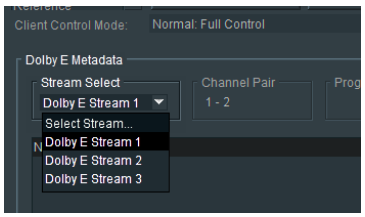
The **Dolby E Metadata** field will display the associated metadata of a source Dolby E stream.

Note that the channel pair associated with the selected Dolby E stream is defined in the Audio section; see section 9.10.1 above.

Assuming that there physically is a Dolby E stream present at the input matching with the Dolby E stream selected, the associated Dolby metadata will be displayed in this field.



9.11.1 Stream Select



The Stream Select control allows the User to select the input Dolby E stream, for metadata analysis.

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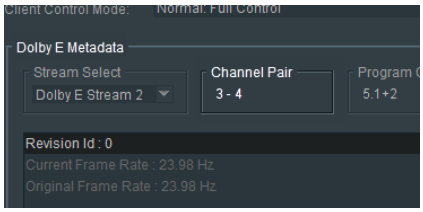
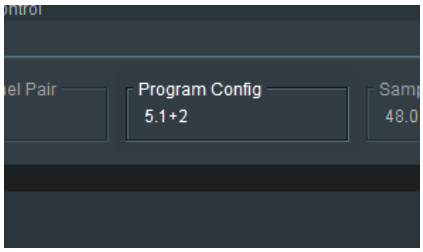
9.11.2 Channel Pair



The **Channel Pair** field gives confirmation of the input Dolby E stream is associated with, as configured in section 9.10.1 above.

In this example; **Dolby E Stream 2** is associated with input **Channel Pair 3-4.**

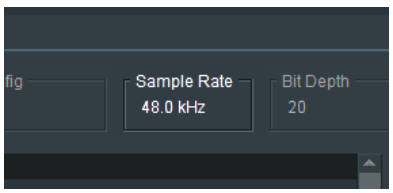
9.11.3 Program Config



The **Program Config** will display the selecting input Dolby E stream configuration.

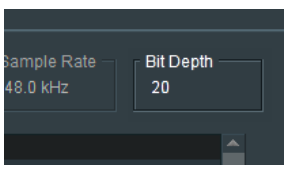
In this example, the input Dolby E stream is a surround sound 5.1 + 2 program.

9.11.4 Sample Rate



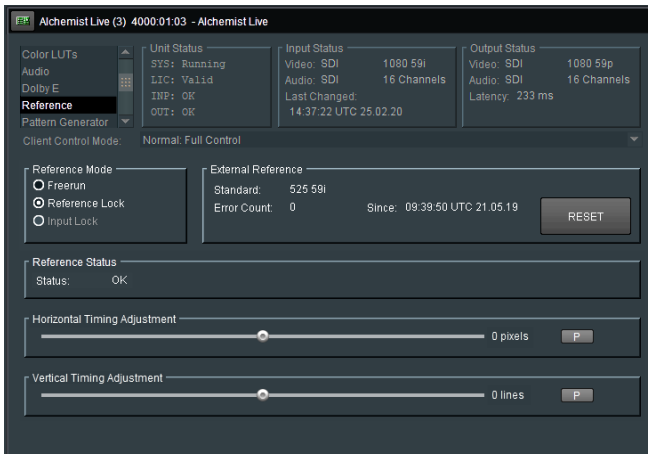
Indicates the audio sample rate.

9.11.5 Bit depth

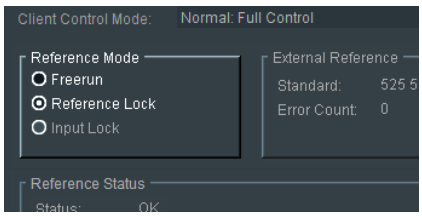


Indicates the bit depth of the incoming Dolby E stream.

9.12 Reference



9.12.1 Reference Mode



Currently, there are two reference modes: **Freerun** & **Reference Lock**

Note that the mode **Input Lock** is not available for the Alchemist Live SDI and will appear greyed out. Input Lock is applicable to Alchemist Live IP.

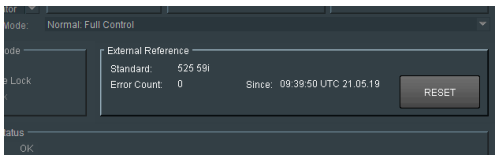
Selecting **Reference Lock** mode will Genlock the system provided that a suitable reference signal is applied.

Alchemist Live will lock to either a bi-level sync, or a tri-level sync.

An analogue reference signal should be applied that matches the configured output frame-rate of the Alchemist Live.

9.12.2 External Reference

Once locked, confirmation of the reference standard is displayed:



Note that the stability of the Reference lock state is monitored via an error count. This may be reset to zero by pressing the **RESET** button.

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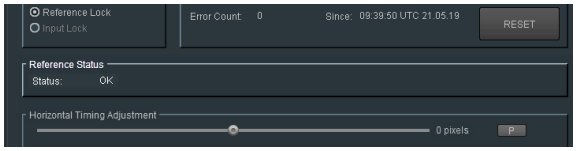
9.12.3 Reference Status



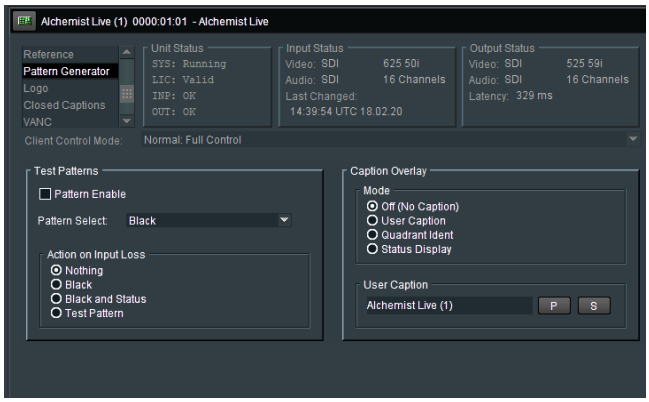
A successful locked condition will be identified in the **Reference Status** pane, as:

- Status: OK

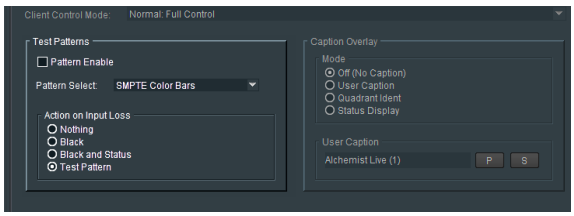
9.12.4 Genlock Timing

Picture position relative to Reference, can be adjusted both horizontally and vertically using the slider controls.

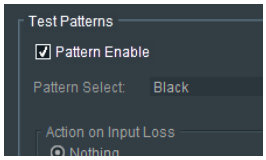
9.13 Pattern Generator



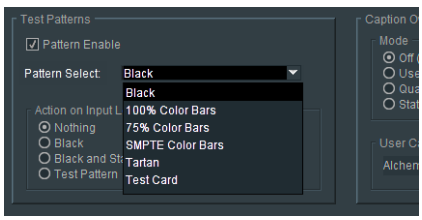
9.13.1 Test Patterns



The test pattern generator is enabled using the **Pattern Enable** check box:



Pattern Select



The required pattern can be configured using the drop-down menu.

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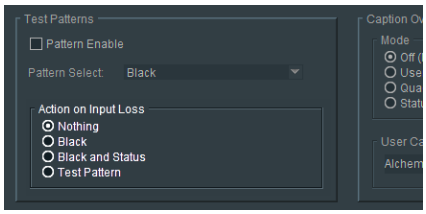
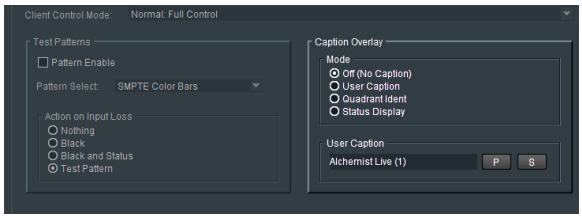
Action on Input Loss



The **Action on Input Loss** control allows the Operator to configure the output in the event of the input becoming lost.

Should the setting be: **Black and Status**, upon loss, the output will cut to a black field, with a caption indicating input loss:

9.13.2 Caption Overlay



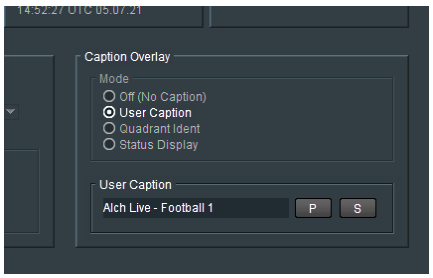
The **Caption Overlay** feature allow the Operator to easily identify the downstream transmission path.

Mode – Off (No caption)

The default mode is **Off.** No caption is inserted in the output.

Mode - User Caption

If required, the caption can be changed to something more meaningful:



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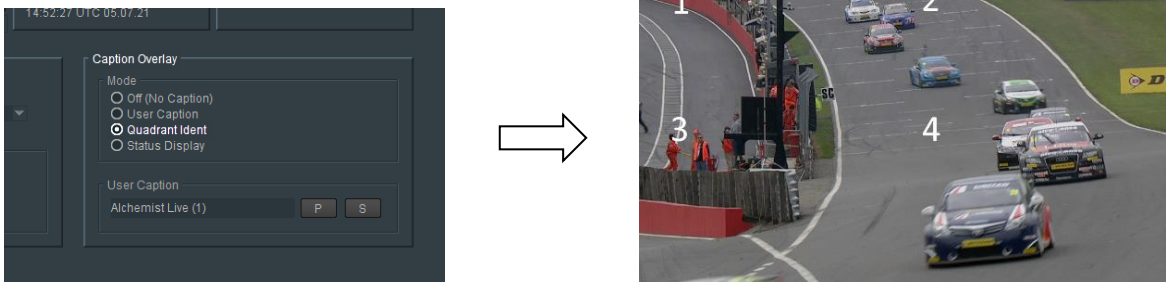
Mode – Quadrant Ident

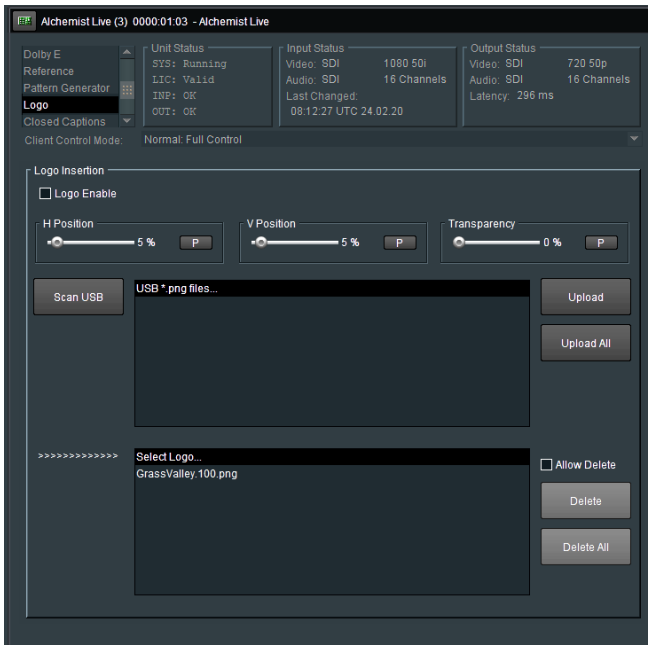


This setting is only applicable when the output is 4k/UHD Quad SQD.

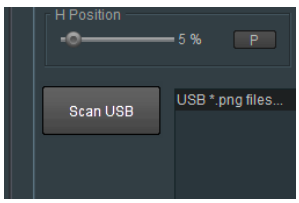
Mode – Status Display

When enable, the **Status Display** feature will insert text describing the current conversion configuration.

9.14 Logo Insertion

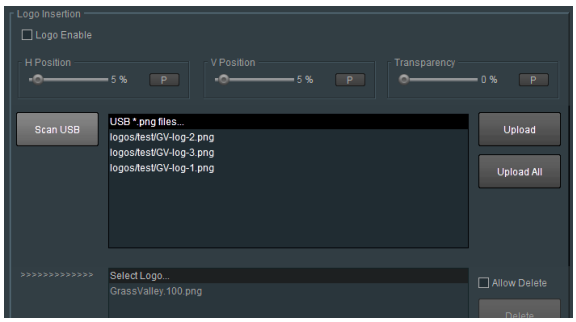


Scan USB



Logos are imported to the Alchemist Live system via a USB Drive. Logo should be in the form of a .png file.

Any .png files present on the USB drive will appear in the top pane, when the USB is scanned:



Any logo file appearing in the left pane can be uploaded to the Alchemist System by selecting the appropriate logo file and pressing the Upload button.

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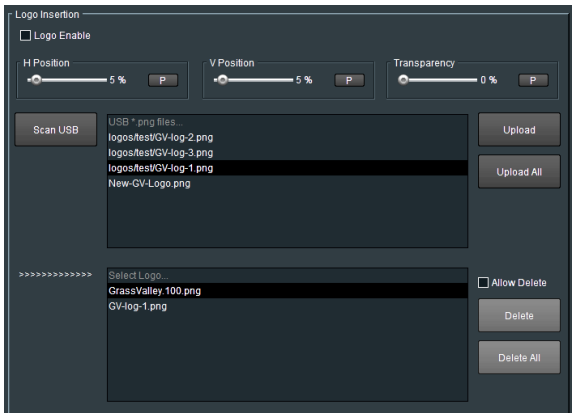
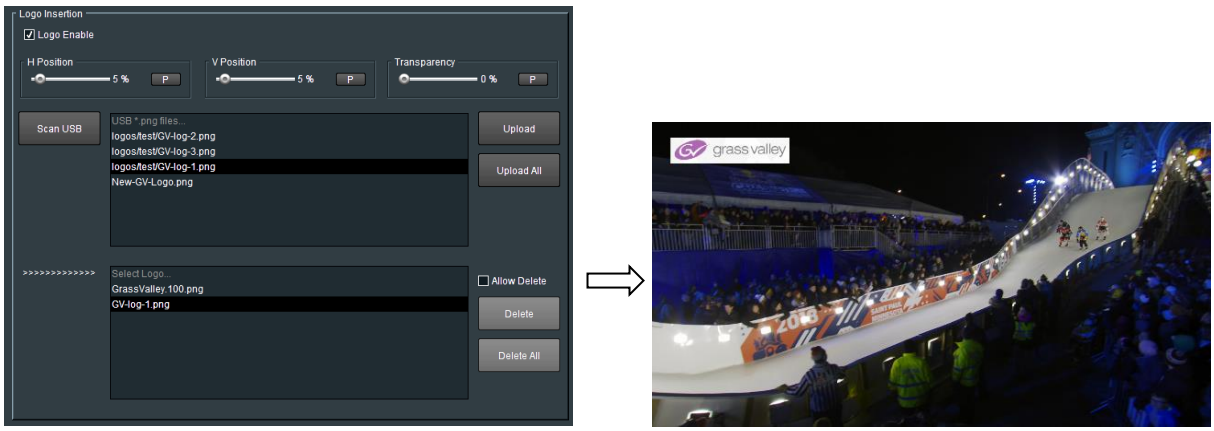
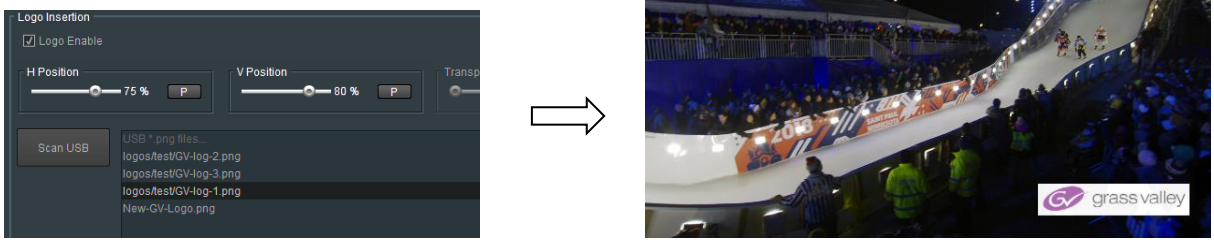
The Logo file will now appear in the lower pane:



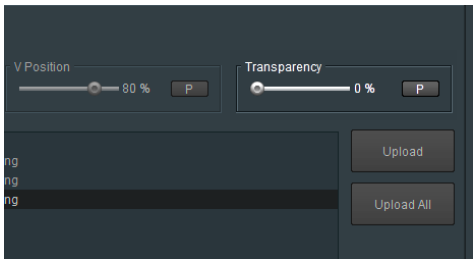
Any logo appearing in the lower pane can be selected and then inserted into the output picture by checking the **Logo Enable** control:



The position of the inserted Logo may be adjusted using the **H Position** and **V Position** controls.



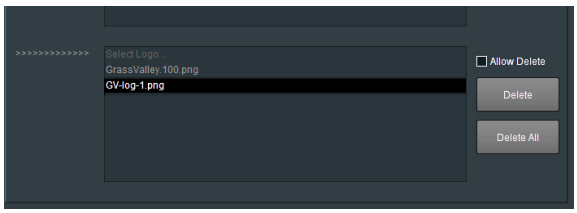
The transparency of the inserted logo may be adjusted using the **Transparency** control:



Note that the resolution of the Logo .png file, will dictate the size of the logo on screen.

Example – a logo with a resolution of 100 x 50 pixels, will be 100 pixels wide and 50 lines high, within the output video raster.

Delete



Any logo appearing in the **Select Logo** pane may selected and deleted using the **Delete** button.

All the logos appearing in the **Select Logo** pane may be deleted by selecting the **Delete All** button

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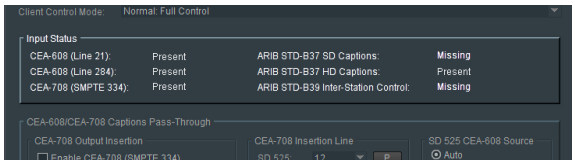
9.15 Closed Captions

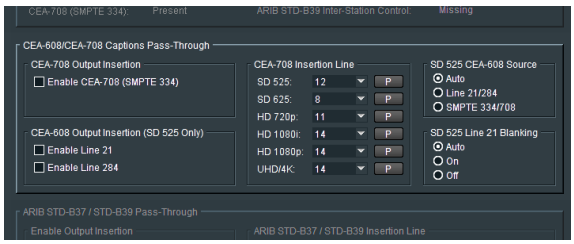
9.15.1 Input Status



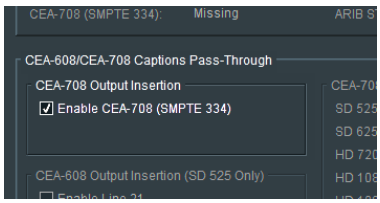
This field reports the presents of incoming Closed Captions.

Captions compliant to CEA 608, CEA 708, ARIB STD-B37, or ARIB STD-B39 will be detected and reported in the **Input Status** field.

9.15.2 CEA-608/CEA-708 Caption Pass-Through



CEA-708 Output Insertion

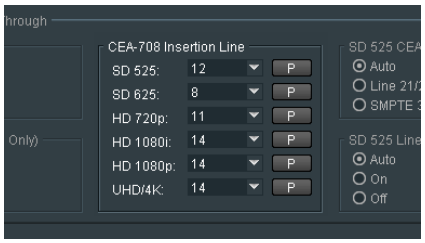


When the **CEA-708 Output Insertion** checkbox is enabled, compliant closed captions present in the input, will be passed to the output.

When input closed captions are Native CEA-708, closed captions will be passed to the output in the form of Native CEA-708 caption carried within a VANC packet.

When the input captions are compliant to CEA-608, the output captions will be CEA-608 caption carried as a CEA-708 Compatibility Byte within a VANC packet.

CEA-708 Insertion Line



Here the output insertion line for captions, compliant to CEA708, can be defined with respect to the selected output video standard.

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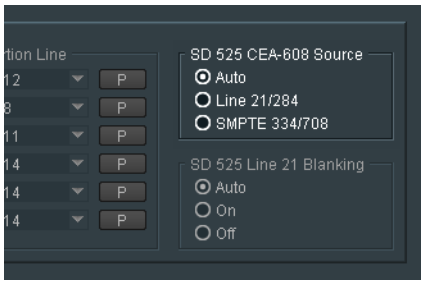
SD 525 CEA-608 Source



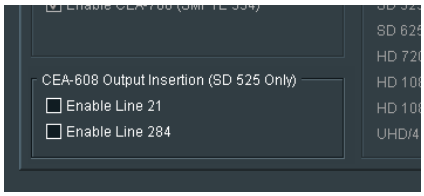
Incoming Closed Caption in the SD domain are only supported when the input is 525/59i.

Captions can either be compliant to CEA-608 carried on lines 21/284, or can be CEA-708 compatibility byte, carried in VANC.

In **Auto** mode, the Alchemist Live will automatically pass captions of either type. If both are present, captions on Line 21 will take priority.

Alternatively, the caption type can be forced to either caption type by enabling the appropriate checkbox.

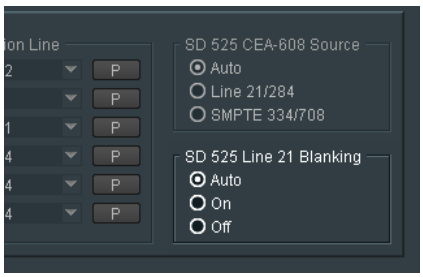
CEA-608 Output Insertion (SD 525 Only)



This control is only applicable when the output is SD 525/59i and when the input closed captions are compliant to either CEA-608, or CEA-708 Compatibility Bytes.

The output lines (21 and 284) destined to carry the output Closed Captions can be enabled or disabled.

SD 525 Line 21 Blanking



This is an input blanking control. When enabled, this control will blank line 21 of the input, to ensure that closed caption information from the input, is not seen in the active output picture.

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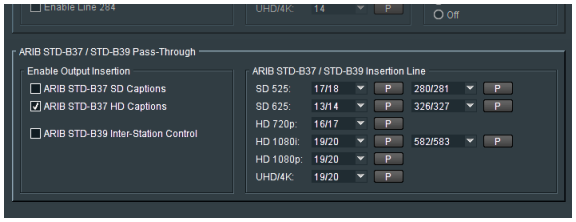
9.15.3 ARIB STD-B37/STD-B39 Pass-Through



ARIB captions present in the input can be passed through to the output by selecting the appropriate **Enable Output Insertion** control.

The specific lines that the ARIB captions are inserted on can be defined.

Note that each standard has a two line selection. The first line defines the line that STD-B37 captions are inserted on and the second line defines the line that the STD-B39 captions are inserted on.

For interlaced standards controls are offered for both fields.

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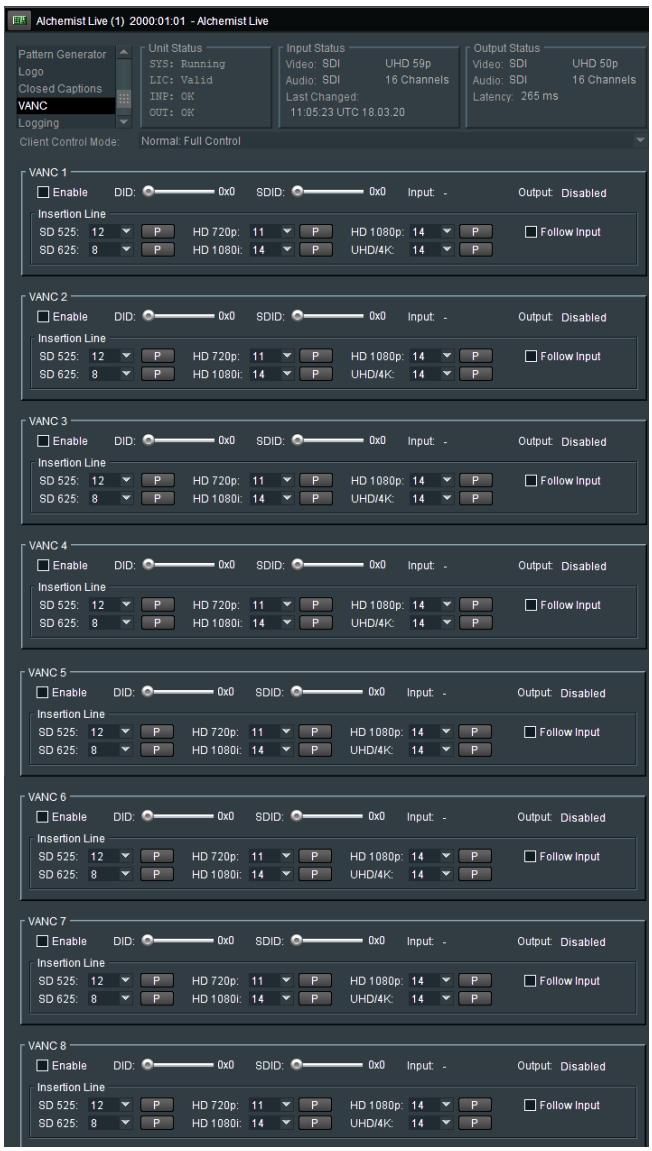
9.16 VANC



The VANC feature allows VANC information in the source, to be defined and passed to the output.

This is a simple VANC pass-through feature and will not modify the VANC packet.

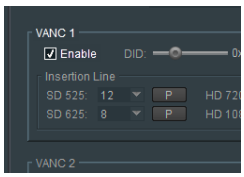
Up to 8 VANC packets may be passed through from source to output.

Each VANC output can be configured to be on specific line at the output, specify to the output standard.

9.16.1 VANC 1 to VANC 8

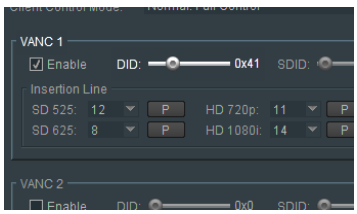
Alchemist Live SDI supports passing up to 8 VANC packets. Menu's **VANC 1** to **VANC 8** are available to configure each individual VANC packet from input to output. All 8 menus are identical.

Enable



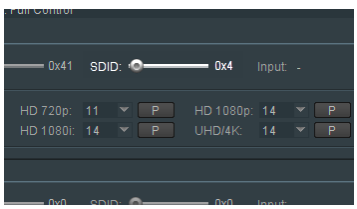
VANC packets will only be passed when enabled.

DID (Data Identifier)



The **DID** slider control can be used to define the incoming DID VANC packet. The DID value is expressed as a hexadecimal number.

SDID (Secondary Data Identifier)



The **SDID** slider control can be used to define the incoming SDID VANC packet. The SDID value is expressed as a hexadecimal number.

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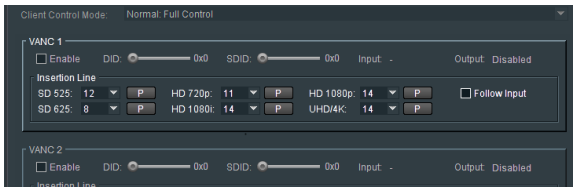
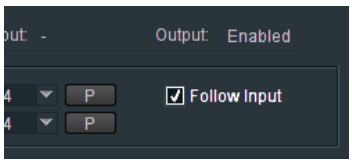
Insertion Line



The Insertion Line submenu allows the User to configure which output line the relevant VANC packet is to be inserted on. Settings are available for each output format, meaning that as the output format is changed, the VANC packet does not need to be reconfigured.

Follow Input



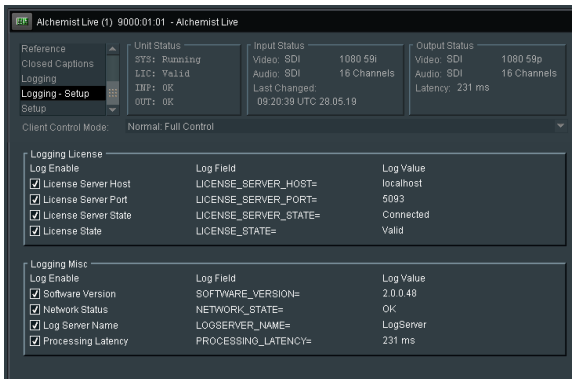
When selected, the relevant VANC packet will be inserted in the output, on the same line as it is in the input.

9.17 Logging

In the **Logging** menu, log fields may be *enabled* and *disabled*. Log fields are sent to the defined Log Server (see 8.7.5 above).

The default configuration is; everything *enabled*.

9.17.1 Logging - Setup



In the **Logging - Setup** menu, log fields specifically for licensing and miscellaneous items. Logged items may be *enabled* and *disabled*. Log fields are sent to the defined Log Server (see 8.7.5 above).

The default configuration is everything *enabled.*

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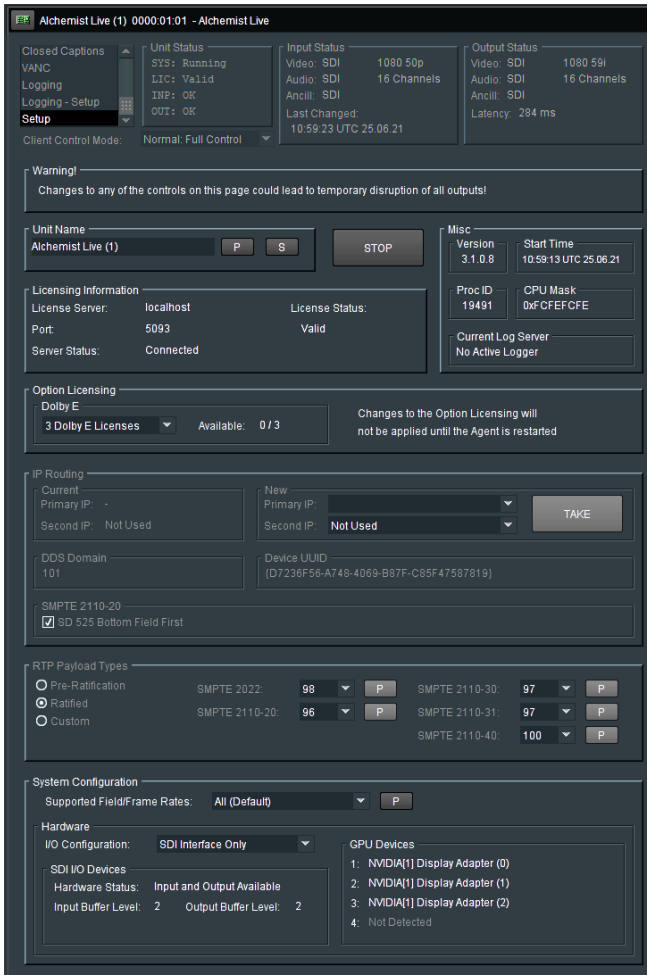
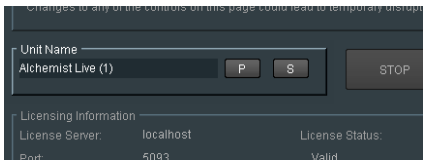
9.18 Alchemist Live Setup



9.18.1 Unit Name



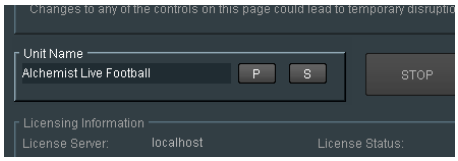
An Alchemist Live running in UHD/4K mode will only have a single Alchemist Live processor. The default name will be:

- **Alchemist Live (1)**

An Alchemist Live running in three channel mode, will assign the default names as:

- **Alchemist Live (1)**
- **Alchemist Live (2)**
- **Alchemist Live (3)**

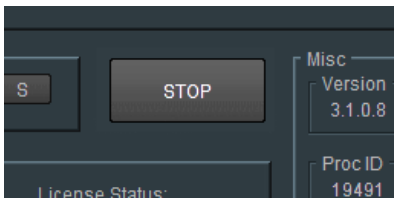
In all cases, the Alchemist Live name may be edited:



Once the new name has been typed in, pressing the ‘S’ button will save the change.

Pressing **P** will reset the Unit Name to the default setting.

9.18.2 Agent STOP

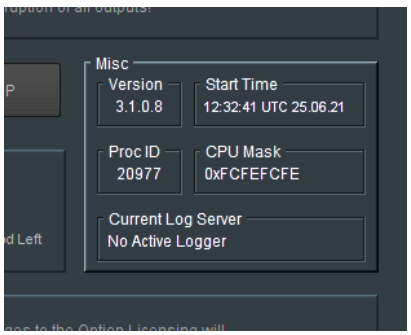


Pressing the **STOP** button will stop the Alchemist Live Agent.

If the Agent is stopped, the template will close.

The Agent can be restarted from the **GV Live** template (see part 8.1.2 above).

9.18.3 Misc: Version/Start Time/Proc ID/CPU Mask/Current Log Server



Misc offers a number of useful information fields.

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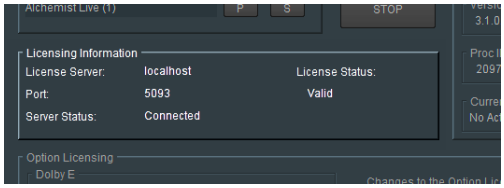
9.18.4 License Information



In the **License Information** pane, details of the license server are reported.

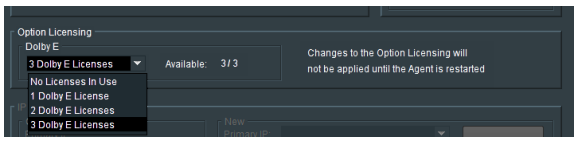
9.18.5 Option Licensing

In the **Option Licensing** pane, details of the license server are reported.

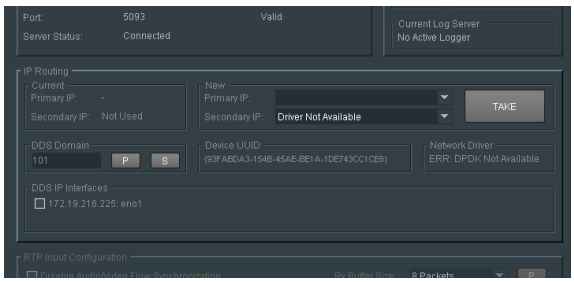
In release V2.1.0.24 or later, the only features that require optional licensing is Dolby E.

Note that in this example, 3 licenses exist and 3 are available (3 / 3)

Licenses can be applied by using the drop-down menu:



9.18.6 IP Routing

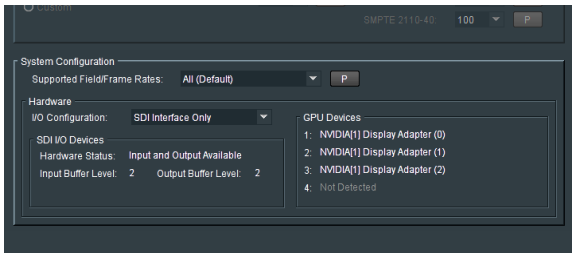


Video I/O via RTP menu is only appropriate to the Alchemist Live IP variant of the Alchemist, hence the **IP Routing** field is greyed-out and cannot be interacted with.

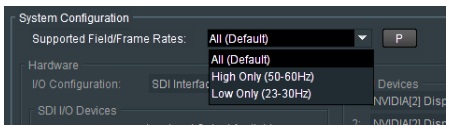
9.18.7 RTP Payload Type

The RTP Payload Types menu is only appropriate to the Alchemist Live IP variant, hence this field is greyed-out and cannot be interacted with.

9.18.8 System Configuration



Supported Field/Frame Rates



The **Supported Field/Frame Rates** control allows the Alchemist Live to be configured to allow either only high frame rate conversion, or only low frame rate conversion.

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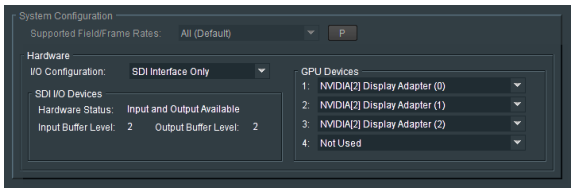
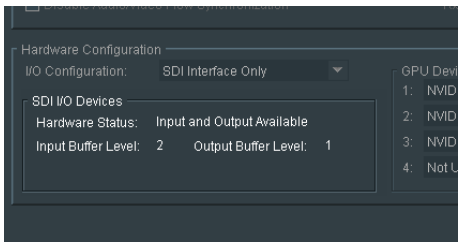
Hardware



SDI I/O Devices

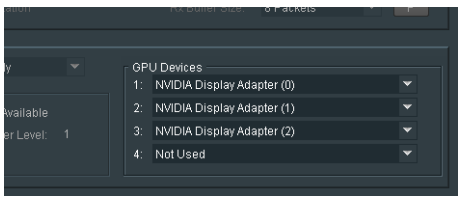


Hardware Status: Reports the status of the two Video Interface cards.

Input Buffer Level: Reports the latency attributed to the input Video Interface card, in terms of frames.

Output Buffer Level: Reports the latency attributed to the output Video Interface card, in terms of frames.

GPU Devices



The **GPU Devices** field confirms the GPU resource available for video processing.

This field is non-interactive.

Table 2: Supported Resolution/Framerate

Supported Resolution	Framerate
525i (720x480)	**29.97psf, 59.94i**
625i (720x576)	**25psf, 50i**
720 (1280x720)	**50p, 59.94p, 60p**
1080 (1920x1080)	**23.98p, 24p, 25psf, 25p, 29.97psf, 29p, 30p, 50i, 50p, 59.94i, 59.94p, 60i, 60p**
UHD (3840x2160)	**23.98p, 24p, 25p, 29.97p, 30p, 50p, 59.94p, 60p**
4K (4096x2160)	**23.98p, 24p, 25p, 29.97p, 30p, 50p, 59.94p, 60p**

Notes:

1. The supported Resolutions/Frame Rates apply to both Alchemist Live input and output.
2. *High* to *Low* frame rate conversion is not supported (i.e 50p to 23p).
3. *Low* to *High* frame rate conversion is not supported (i.e 29.97p to 50p).

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10. The Console

10.1 Introduction

Alchemist Live runs on Linux Ubuntu OS. It is appreciated that many Users will have little or no experience of using this OS. In consideration of this, Alchemist Live includes a Console offering easy configuration of key elements of the system. Some of the Console features require the use of a USB stick. USB sticks will be automatically mounted and should be formatted as either FAT32 or NTFS.

Warning – the Console should not be interacted with when Alchemist Live is processing video as part of a live broadcast, as this can cause minor disturbances on the output pictures.

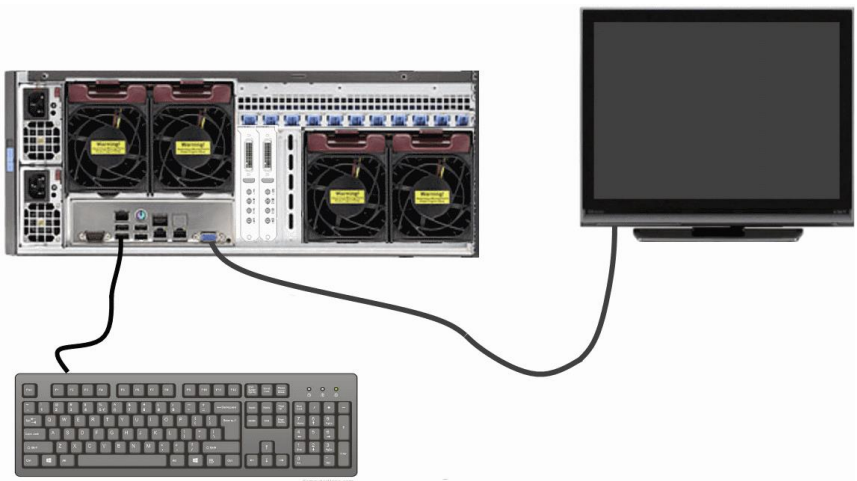
Using the Console, the following items are easily configured:

- Network – NIC 1 (eno1) static IP only, NIC 2 (eno2) may be configured to be either Static IP or DHCP.
- The *time* and *date* may be set.
- An upgrade process may be initiated.
- A new license may be installed.
- The status of the system may be displayed.
- Operational Logs may be retrieved.
- The Server can be re-started.
- The Server can be shut down.

10.2 Accessing the Console

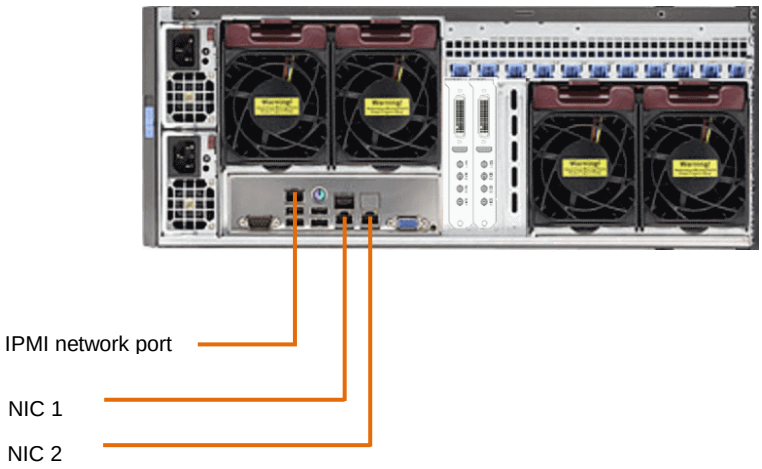
To access the Console connect a monitor to the on-board VGA and connect a USB keyboard.

1. Connect a Monitor, and Keyboard to the Alchemist Live Host machine:



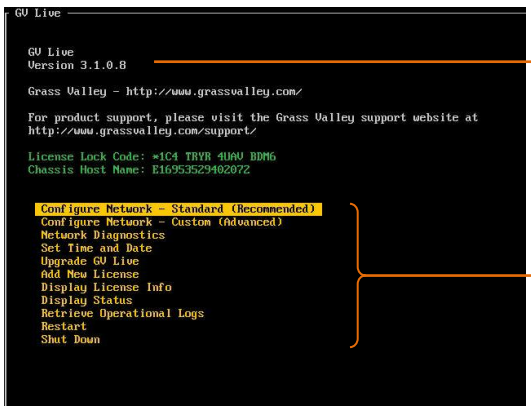
2. Connect a Network cable to the Server:

   Note that there are 3 network ports.



- NIC 1 (eno1) is factory configured with the default Static IP Address: 192.168.0.1. This port maybe set to another static IP address but cannot be set to DHCP.
- NIC 2 (eno2) is factory configured as DHCP. This port maybe configured as static, or DHCP.
- IPMI port allows control of the IPMI interface (see section 11, below).

3. Boot up the Alchemist Live. Once the boot sequence has completed, the Console will be displayed:



Note that the GV Live software version is reported.

Configurable items

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10.2.1 Retrieval of the License Lock Code:

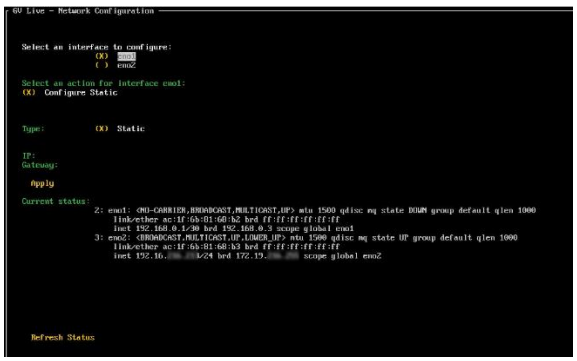
The License Lock Code is reported in the Console:

10.2.2 Configure Network – Standard (Recommended)

Using the up/down arrows on the keyboard, highlight the item to be configured.

In this case: **Configure Network**

Press return and the Network Configuration menu will now be displayed:

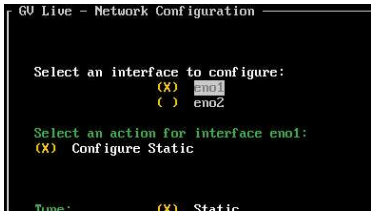


Note that in the Console:

- **NIC 1** equates to **eno1***
- **NIC 2** equates to **eno2**

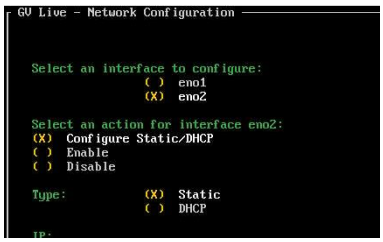
***** This port maybe set to another static IP address, mask and gateway but *cannot* be set to DHCP.

Using the up/down arrows on the keyboard, highlight the NIC to be configured. In this example NIC 1 is selected:



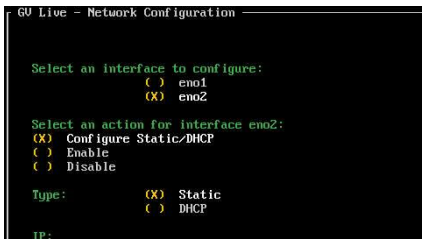
Now press the *space bar* on the keyboard to select the NIC.

Using the up/down arrows on the keyboard, move down to the **Configure** section**.** Note that the menu options will update to:



Select the desired configuration.

If the selection is **Static,** press the **Tab** button again and the display will update again, this time with fields to enter an **IP Address** and **Gateway** visible:



Using the up/down arrows on the keyboard, highlight **IP** (IP will turn white):

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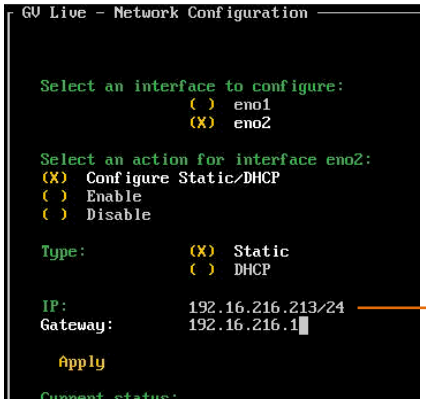
Type in the required address:



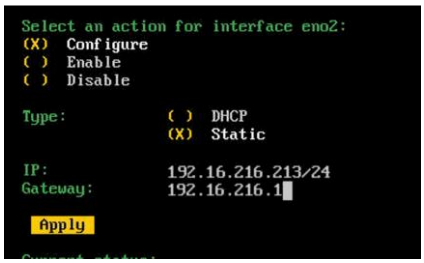
Note:

The IP Address **must** be appended with: **/xx**

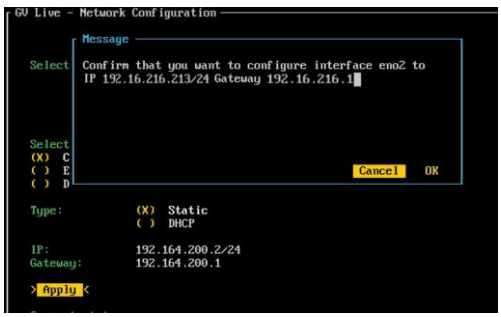
In this example: **192.16.216.213/24** with a Gateway **192.16.216.1**

If it is desired to communicate over an associated/trunked/bridged network, then a Gateway Address will be required.

Once **IP Address** and **Gateway** have been configured, using the up/down arrows on the keyboard, navigate to and highlight: **Apply**



Press return and a confirmation of the configuration change will be asked for:



Select **OK**.

Note that confirmation of the new Static IP Address is displayed in the **Current status** section:

NIC 2 now configured

If the NIC has been configured to be DHCP, the IP Address will be displayed in the Current Status section.

To exit the **Configure Network** menu, navigate down to the **OK** symbol (bottom right corner of display):

Select **OK**. This will return the display to the top menu of the Console.

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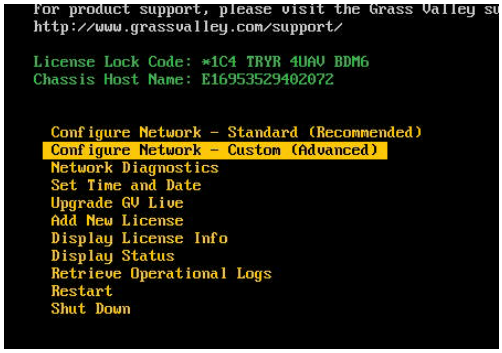
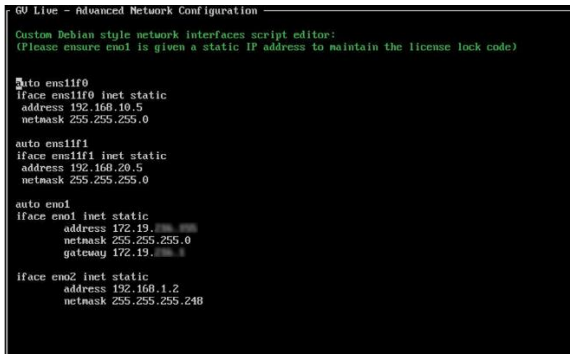
10.2.3 Configure Network – Custom (Advanced)



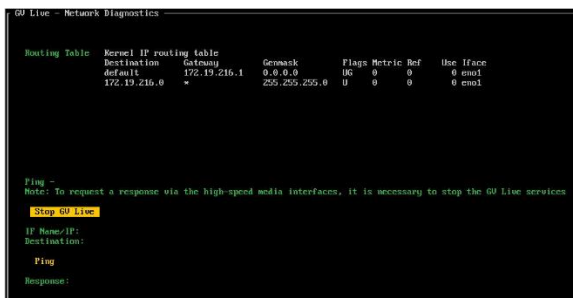
Selecting **Configure Network – Custom (Advanced)** will bring up the **Advanced Network Configuration** menu:



The GV Live console network configuration now includes an ‘Advanced’ option which is an alternative to the basic approach offered by previous versions of Alchemist Live.

This allows full manual configuration of the unit’s Debian-style network script and allows more sophisticated routing options should it be required. An example would be the creation of static routes.

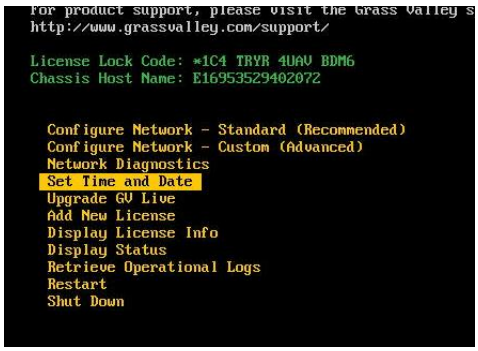
10.2.4 Network Diagnostics



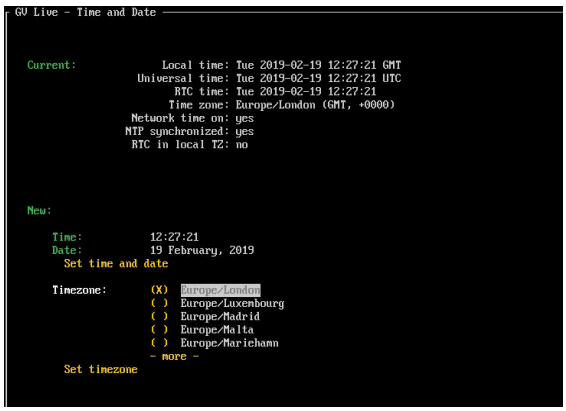
Network Diagnostics includes a ‘ping’ feature allowing interrogation of associated networks.

10.2.5 Set Time and Date

Using the up/down arrows on the keyboard, highlight **Set Time and Date:**



Select return to enter the **Set Time and Date:**



Select OK to complete the process, and return to the top menu.

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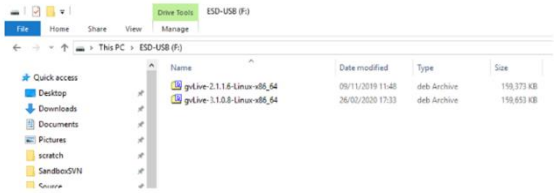
10.2.6 Upgrade GV Live

The Software Update will need to be uploaded to a USB Drive.

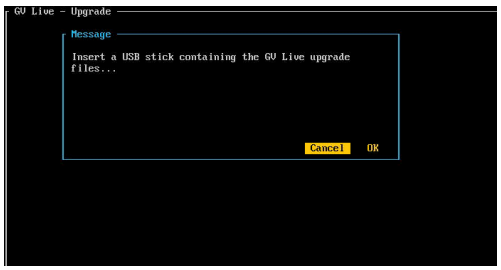
If the software package is in the form of a Zip file, it should be unzipped prior to being uploaded to the USB drive:



In this example there are two versions of code present on this USB drive.

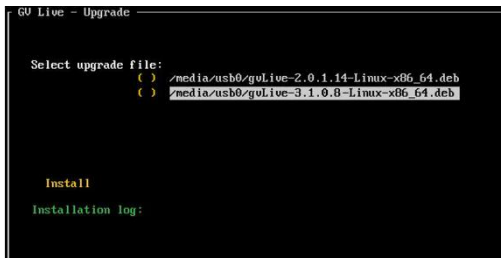
Using the **up/down** arrows on the keyboard, highlight **Upgrade GV Live**:

Press *return* and a system prompt will appear to insert the USB Drive.



Insert the USB drive.

Note that if there are multiple versions of Alchemist Live software on the USB drive, a menu will appear where by the desired version can be chosen:

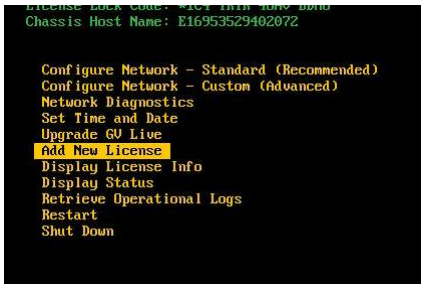


Select **Install** to complete the process. After install a prompt will appear to re-boot the system.

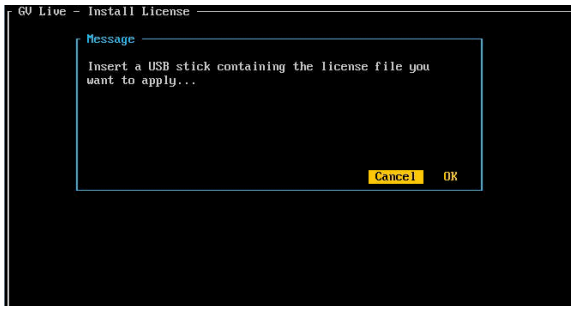
10.2.7 Add New License

The License File will need to be copied onto the root of the USB Drive.

Using the **up/down** arrows on the keyboard, highlight **Add New License:**



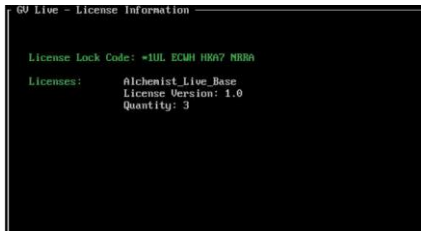
Press *return* and a system prompt will appear to insert the USB Drive.



Follow the on screen instruction to complete the process.

10.2.8 Display License Info

When selected, the details of the installed License will be displayed.



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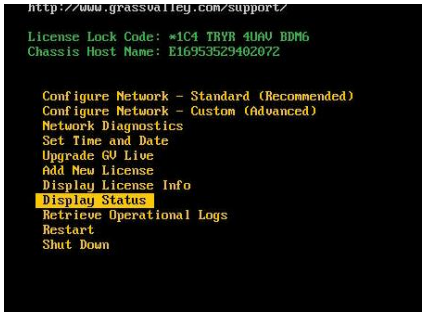
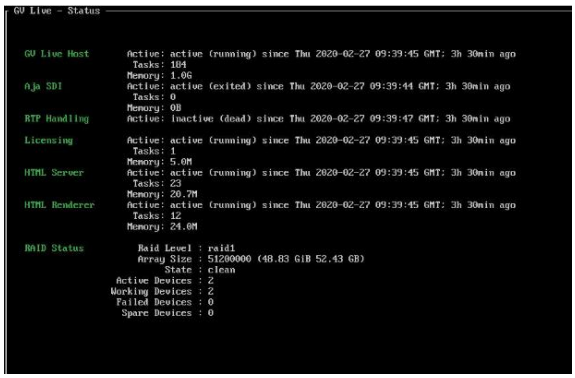
10.2.9 Display Status

Using the **up/down** arrows on the keyboard, highlight: **Display Status**



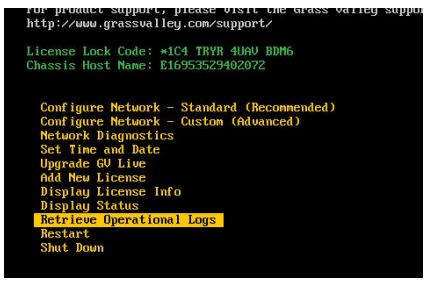
Press ***return*** and the **Status** page will be displayed:



10.2.10 Retrieve Operational Logs

The Operational logs will be downloaded onto a USB Drive.

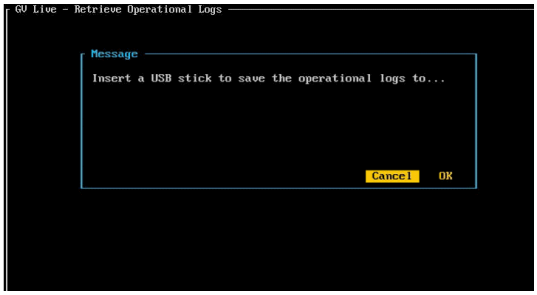
Using the **up/down** arrows on the keyboard, highlight: **Retrieve Operational Logs**



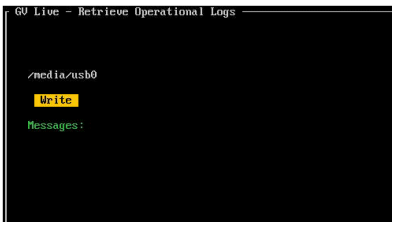
Press *return.*

The logs would usually be written to a USB Drive.

If no USB is present, a message will appear prompting the Operator to insert a USB drive:

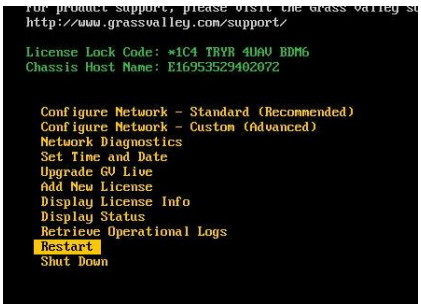


Once a USB Drive is available, the User will be prompted to write the file:



10.2.11 Restart

Using the **up/down** arrows on the keyboard, highlight: **Restart**



Press *return* to restart the GV Live Host machine.

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10.2.12 Shut Down

Using the **up/down** arrows on the keyboard, highlight: **Shut Down**

Press *return* to power down the GV Live Host machine.

Note: Pressing the chassis power button will also stimulate a system **Shut Down**.

11. IPMI

11.1 Introduction

The **Intelligent Platform Management Interface** (**IPMI**) is a set of computer interface specifications that provides management and monitoring capabilities independently of the host system's CPU, firmware (BIOS or UEFI) and operating system.

Practical uses of this application for Alchemist Live include:

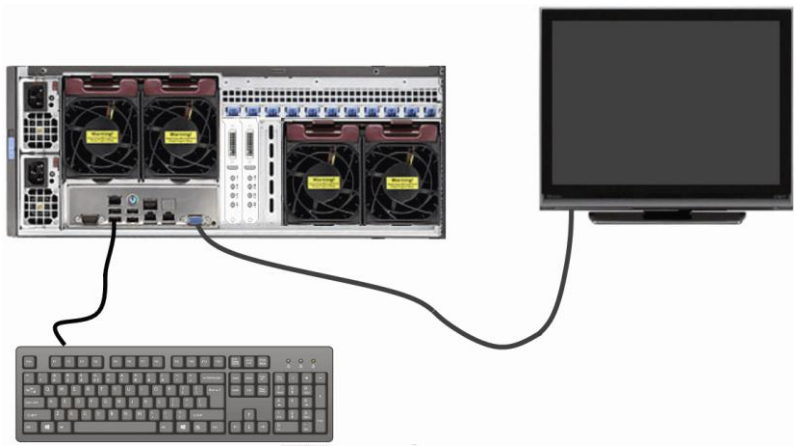
- Remote access to the host machine.
- Remote power cycling.
- Remote access to the BIOS of the host machine.

Warning – the Host Machine should not be interacted with via the IPMI port, when Alchemist Live is processing video as part of a live broadcast, as this can cause minor disturbances with the output video stream.

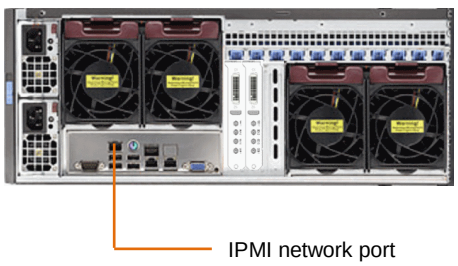
11.2 IPMI IP Address Configuration

The initial configuration of the IPMI network address will require local access to the GV Live host machine.

1. Connect a Monitor and Keyboard to the Alchemist Live Host machine:



2. Connect the IPMI network port to the LAN.



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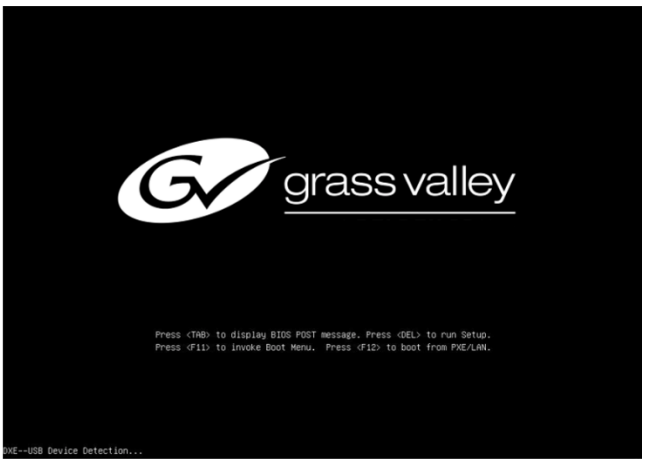
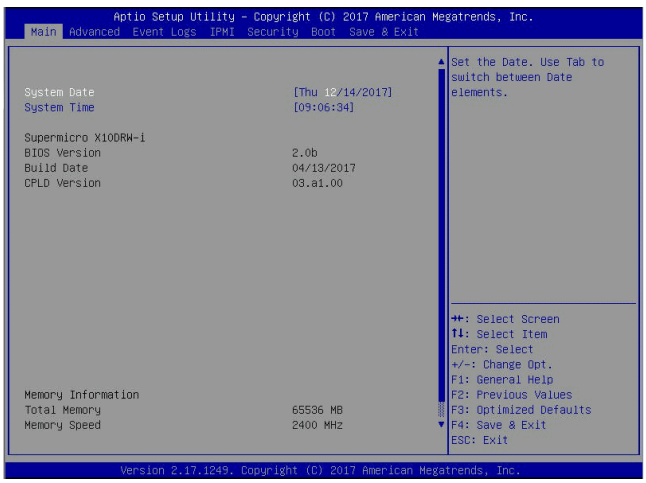
3. Boot up the GV Live host machine.

   Note that the current IPMI IP Address will be displayed on the opening splash screen:

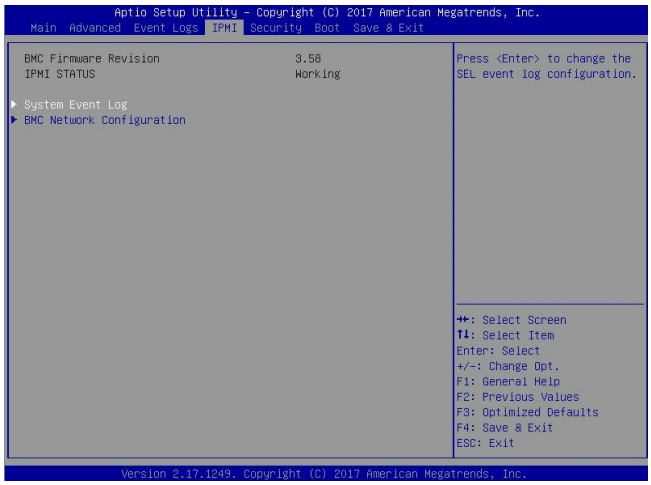
4. Upon seeing the GV splash screen, press **DEL** to enter the BIOS Menu:



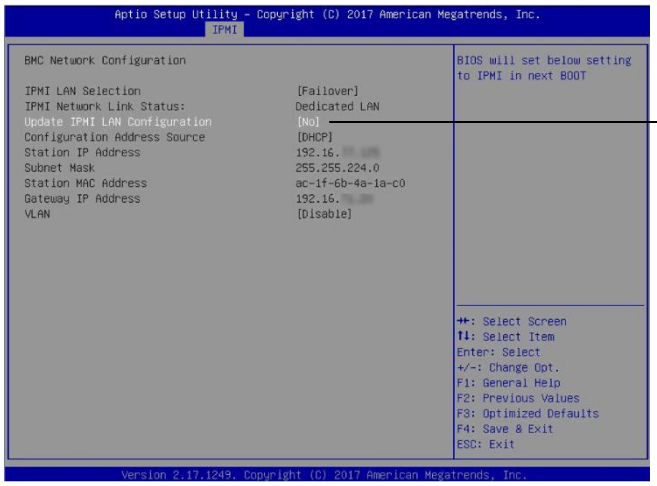
   The BIOS menu will now appear:



5. Navigate to the IPMI menu:



6. Enter the **BMC Network Configuration** submenu.



Update IPMI LAN Configuration

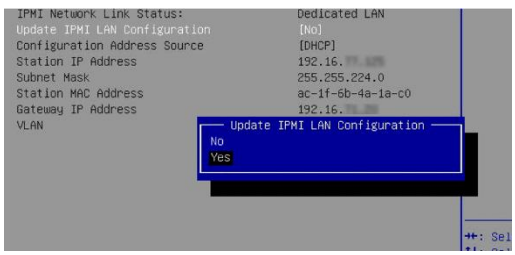
Default setting = [No]

Note that it is possible to lockdown the **BMC Network Configuration** menu, to deter unauthorised configuration.

This is the Factory Default condition of this menu.

If the menu is in lockdown mode, the menu item **Update IPMI LAN Configuration** will be set to [**No]**, as shown above.

In order to interact with the **BMC Network Configuration** menu, it must be unlocked. This is done by setting **BMC Network Configuration** menu to [**Yes].**



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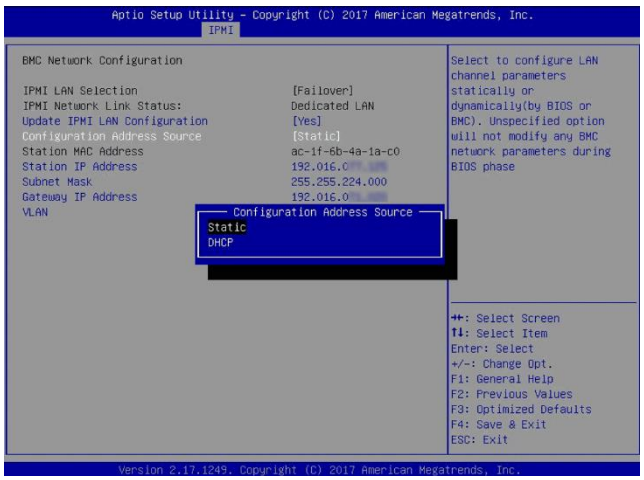
7. The **BMC Network Configuration** menu will now be active.

   In this example the **Configuration Address Source** is set to [**DHCP**].

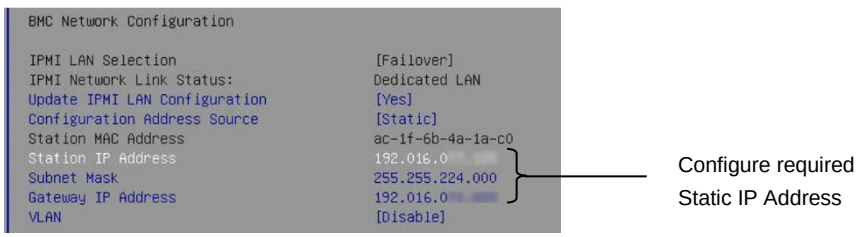
8. If it is desired to configure the address source to be a Static IP Address, select the menu item **Configuration Address Source.** A submenu will appear called **Configuration Address Source:**



   The menu items:

   - Station IP Address
   - Subnet Mask
   - Gateway IP Address

   will all now become active and the desired Static IP Address details maybe configured.



   Save and exit the BIOS menu and the GV Live host machine will continue to boot normally.

11.3 Remote Access via web browser

Remote access to the Alchemist Live, via the IPMI port, is possible from a remote PC. This procedure should work on a PC running Windows, Linux or Apple Mac OS.

The following example details remote access from a Windows PC (procedure should also work for Mac, or Linux)

It is a requirement that Java be installed on the remote PC.

BMC Login

Alchemist Live architecture is based on a Supermicro workstation. Supermicro workstations are pre-configure with unique BMC login details. The login details can be found attached to the shipping carton.

Please refer to the Supermicro document: **BMC Unique Password** for more information.

This can be downloaded from the Supermicro website, here:

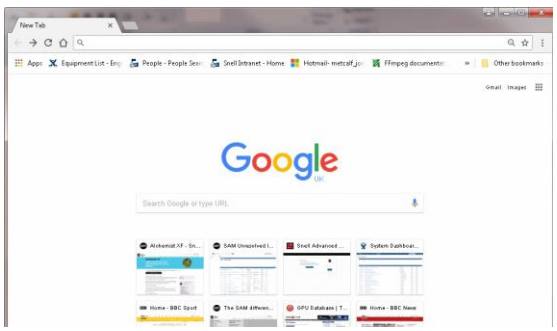
https://www.supermicro.com/support/BMC_Unique_Password_Guide.pdf

1. Open an Internet Browser

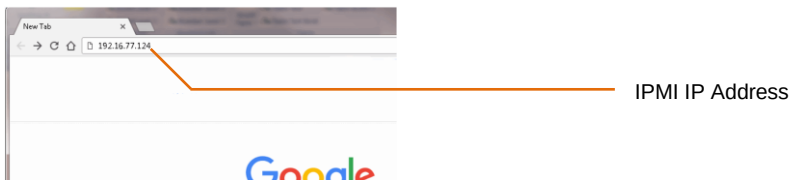
   The following have been tested by GV.

   - **Windows**: Google Chrome / Mozilla Firefox / Internet Explorer
   - **IOS**: Safari

   In this example, on a Windows system Google Chrome is the browser of choice:



2. In the Address Bar, enter the IPMI IP Address:



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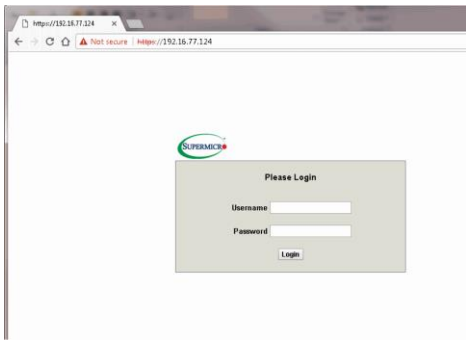
A login page will appear



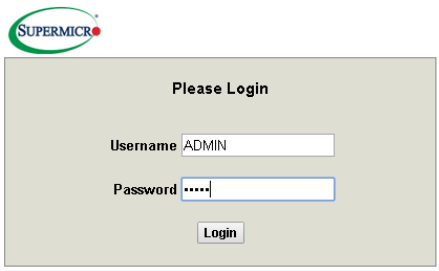
3. Enter the **User Name** and **Password**

Username: ADMIN

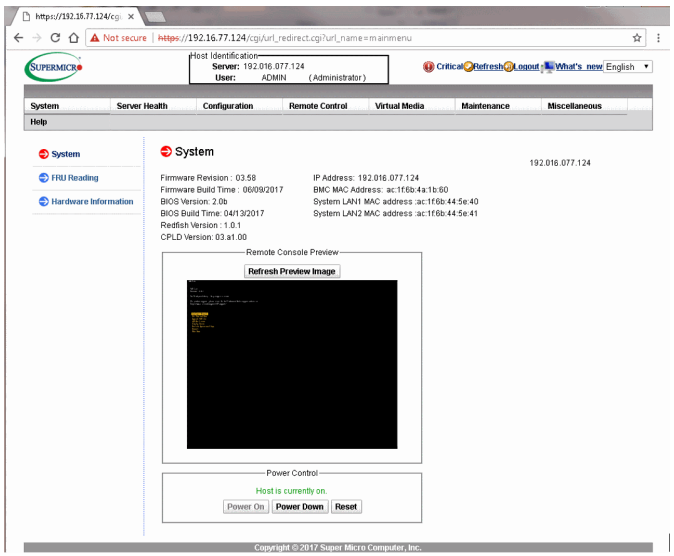
Password: *****

Note: the login details are unique to the Alchemist Live host machine.

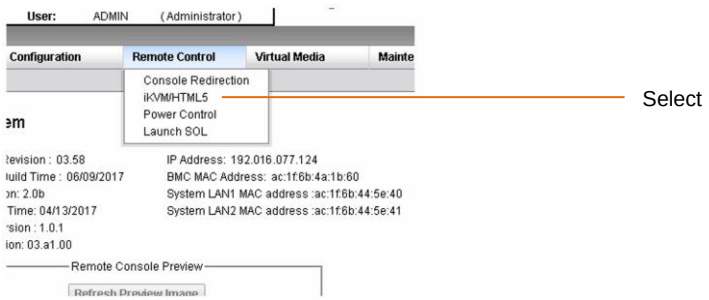
These are factory set (see preamble above).



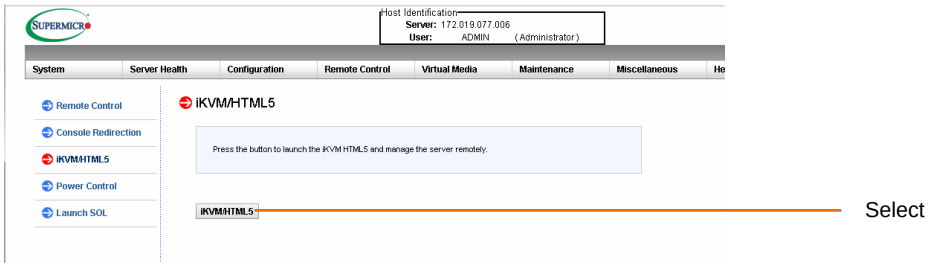
Press *return* to continue. The SuperMicro System menu will load:



4. In the option bar, hover mouse over **Remote Control.** A drop down menu will appear**.** Select **IKVM/HLML5**

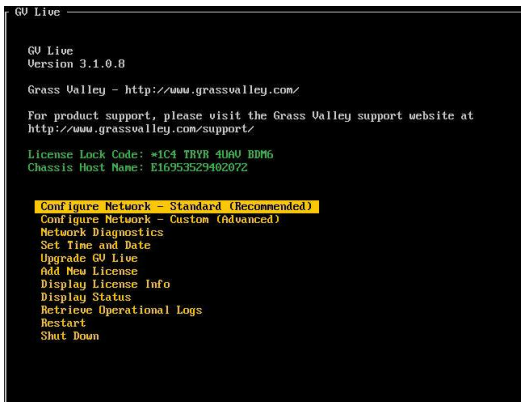


The **IKVM/HTML5** page will appear:



Select **IKVM/HTML5**

The Console should now be displayed:



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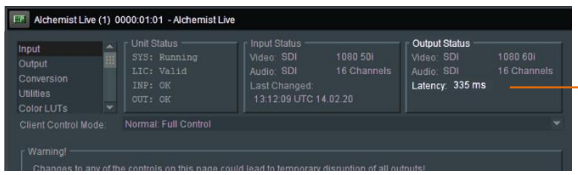
Appendix A. System Latency

The system latency is reported on the **Output Status** pane of the Agent template:



Reported **Latency**

Note that the actual latency will depend on the conversion process being performed. Low frame rate conversion processes typically have a higher latency value, compared to high frame rate processes.

Appendix B. BIOS Settings

The following BIOS settings are configured from the factory and are required to ensure Alchemist Live performs in the intended and optimal manner.

The **BIOS** can be entered by pressing **DEL** on boot.

Advanced > CPU Configuration

- Hyper-threading **Enable**
- AES-NI **Enable**
- Virtualization **Disable**

Advanced > CPU Configuration > Advanced Power Management Configuration

- Power technology **Custom**
- Energy Performance Tuning **Disable**
- Energy Performance BIOS Setting **Performance**
- Energy Efficient Turbo **Disable**

Advanced > CPU Configuration > Advanced Power Management Configuration

- Power technology **Custom**
- Energy Performance Tuning **Disable**
- Energy Performance BIOS Setting **Performance**
- Energy Efficient Turbo **Disable**
- Enter CPU P-States
  - EIST **Enable**
  - Turbo **Enable**
  - P-State Coordination **HW_ALL**
- Enter HWPM State Control
  - HWPM State Control **Disable**
- Enter CPU C-States
  - Package C-State Limit **C0/C1 State**
  - C3 Report **Disable**
  - C6 Report **Disable**
  - Enhanced Halt State **Disable**
- Enter CPU T-States
  - T-State Control **Disable**
  - C3 Report **Disable**

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Advanced > Chipset Configuration > North Bridge > Integrated IO Configuration > QPI Configuration

- Link Frequency Select **9.6GT/s**

Advanced > ACPI Settings

- Numa **Enabled**

Appendix C. HTML5 Web Browser

Introduced in V2.0.1.14, the HTML5 web service offers a control surface for Alchemist Live, directly from a web browser installed on a remote workstation.

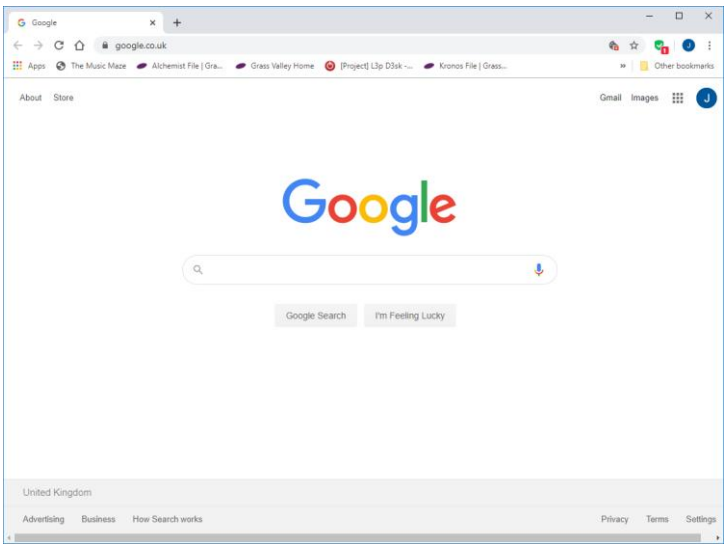
On Linux and Windows platforms, Mozilla Firefox and Chrome web browsers are supported.

On Apple Mac, Safari is supported.

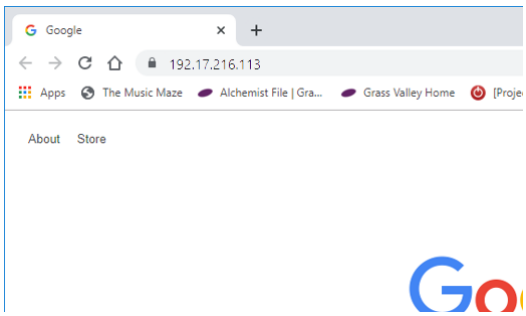
The following procedure describes how to launch the HTML5 web service. In this example Google Chrome is the chosen web browser, but the procedure is the same for all supported web browsers. Note that other web browsers may work, but these are untested by GV.

Procedure:

1. On the remote workstation, launch the web browser:



2. Enter the IP Address of the Alchemist Live:



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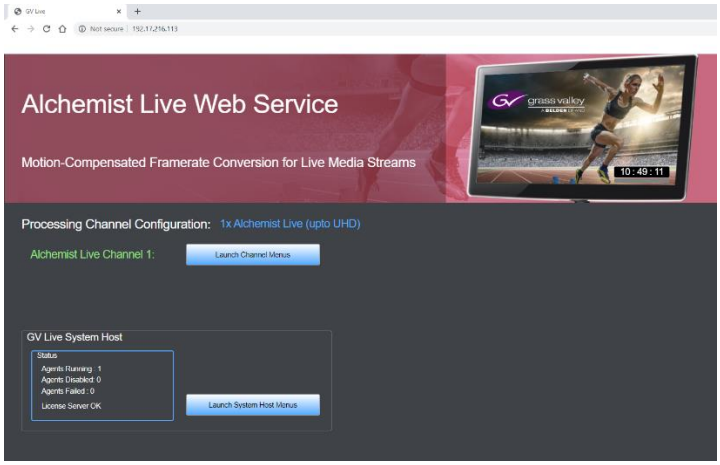
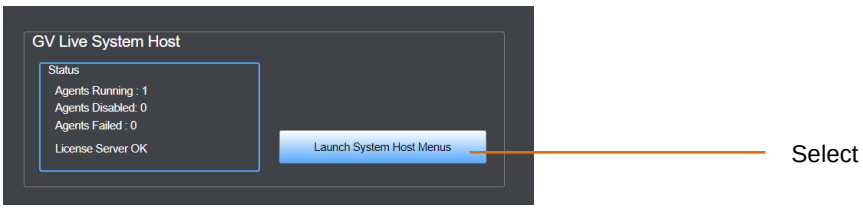
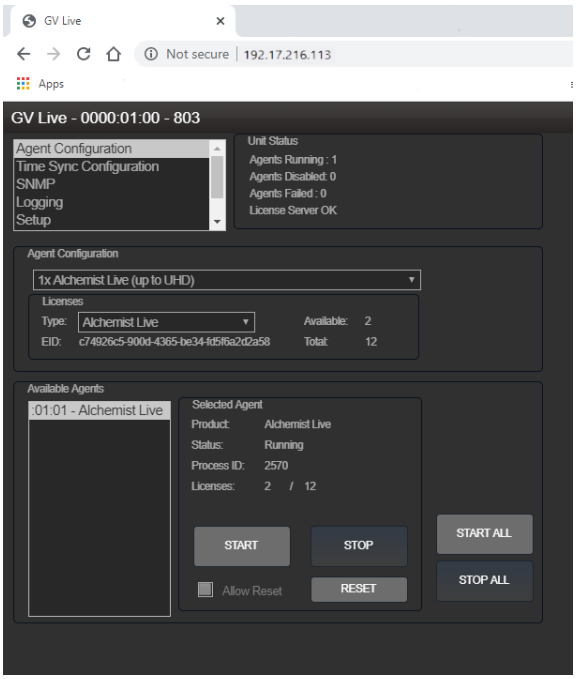
The Alchemist Live HTML5 web service will now load.



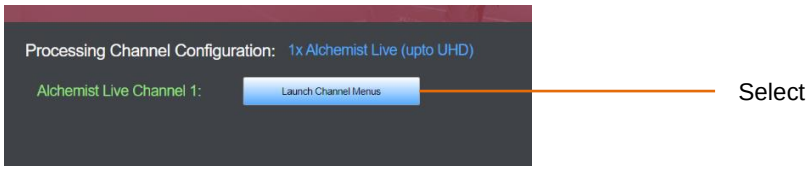
3. Press the **Launch System Host Menus** button.



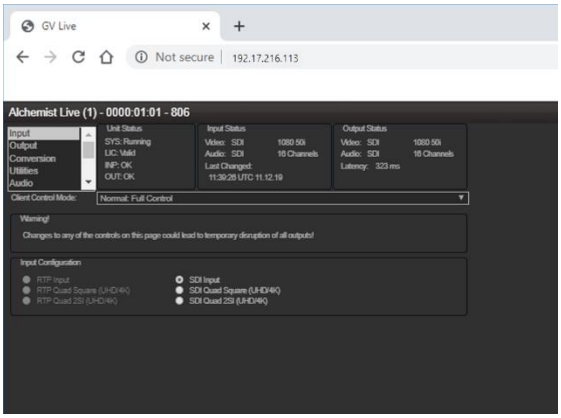
The **Give Live** menu will now load.



4. Press the **Launch Channel Menus** button:



The **Alchemist Live Channel** menu will now load.



The menu structures are the same as RCP and the Alchemist Live can be controlled accordingly.

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Appendix D. RGB Legalizer

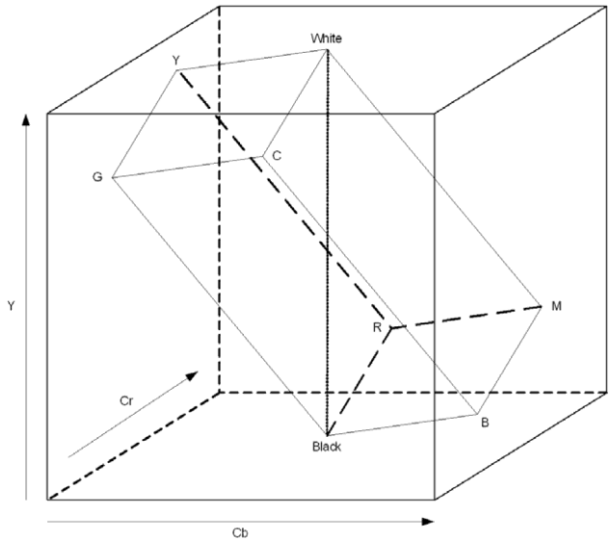
The purpose of the RGB Legalizer is to define limits of YUV peak Luma and Saturation, such that when matrixed to RGB, no illegal colors are generated. Different Broadcasters/Vendors have differing definitions of what constitutes an illegal color, hence several settings are offered, including the Custom mode, making any specific requirements possible.

Alchemist Live incorporates an RGB Legalizer and comprehensive Luma Clipper. The Luma Clipper can be used in combination with the '735mv' legalizer selection to generate images which adhere to EBU R103-200 specification.

RGB Legalizer Overview

Illegal colors are represented by values of RGB that are outside a nominal range (typically 0 to 700mV) when converted to analog values. Illegal RGB colors are easily generated in YCbCr space because of the differences in the valid colorspace between RGB and YCbCr.

RGB occupies a restricted colorspace in the shape of a paralleloid within the YCbCr cube as illustrated in the diagram below.



It can be seen there are many YCrCb values which lie outside the RGB space, and would consequently generate illegal values when converted to analog for display.

Upon detection of illegal RGB colors, there are a variety of techniques to bring them back into legal colorspace. Most legalizers will simply de-saturate the chrominance, leaving the luminance unaltered. The legalizer in the Alchemist Live is more advanced, and is able to preserve the original saturation to a much greater extent by modifying the luminance and chrominance signals simultaneously, giving the best visually subjective results.

RGB Legalizer Controls

- **Off** Disables RGB legalization.
- **700mV** RGB Low 0mV, RGB High 700mV, will comply with area mask set 1% or greater,
- **721mV** RGB Low -21mV, RGB High 721mV, will comply with area mask set 0% or greater.
- **735mV** RGB Low -35mV, RGB High 735mV, will comply with area mask set 0% or greater.

Note: The 735mV selection should be used in conjunction with the Luma Clipper (set at presets) to generate images that adhere to: **EBU R103-200** specification.

Luma Clipper Overview

When luminance levels are too high or too low, devices such as encoders and displays can have problems. The luminance clipper is used to limit signals above and below predefined limits. Minimum and maximum limits can be set, in addition a knee that allows for a graduated transition to the limit.

Luma Clipper Controls

- **Luma Clipper Enable:** This enables the clipper.
- **White Max** This sets up the upper limit (hard clip point) of the clipper. The range is minimum 90% (852 digital 10-bit value) to maximum 109% (1019) with increments of 1%. Preset is 103% (966).
- **White Knee** This sets up the knee for the maximum white limit of the clipper. This can be set up to give a “soft clip” from this knee point to the hard white clip point. The range is minimum 60% (590) to maximum 109% (1019) with increments of 1%. Preset is 100% (940).
- **Black Min** This sets up the lower limit (hard clip point) of the clipper. The range is minimum -7% (4) to maximum 10% (152) with increments of 1%. Preset is -1% (55).
- **Black Knee** This sets up the knee for the minimum black limit of the clipper. This can be set up to give a “soft clip” from this knee point to the hard black clip point. The range is minimum -7% (4) to maximum 60% (590) with increments of 1%. Preset is 0% (64).

Note: The Luma clip preset values configure the clipper to meet Luma limits as specified by EBU R103-200.

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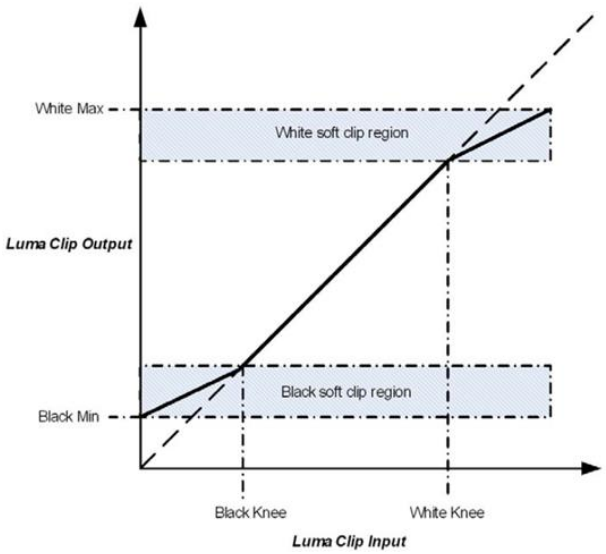


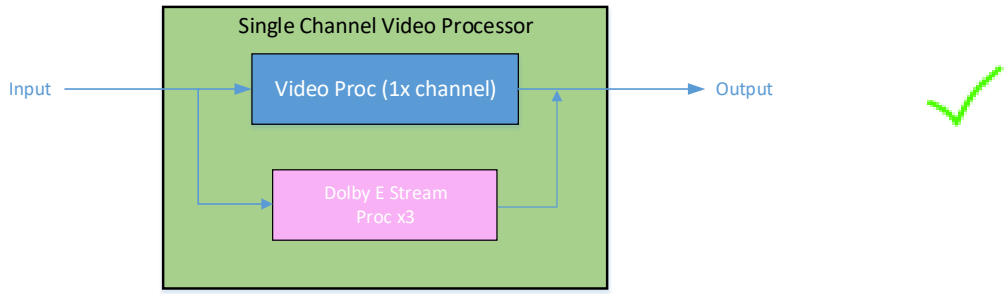
To achieve a hard white clip set the **White Max** and **White Knee** to the same value. Similarly to achieve a hard black clip set the **Black Min** and the **Black Knee** to the same value.

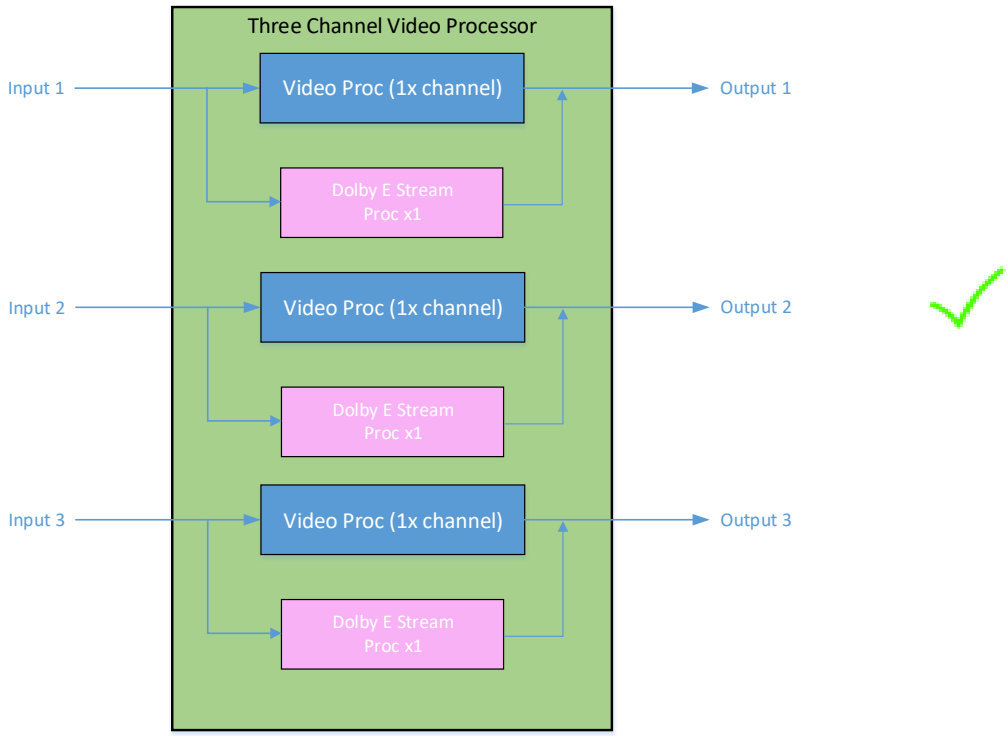
Appendix E. Dolby E Transcode Configuration

Introduced in Version 2.1.0.24, Alchemist Live allows transcoding of up to three Dolby E audio streams.

When Alchemist Live is configured as a single channel video processor, up to three Dolby E audio channels can be transcoded.

When Alchemist Live is configured as a three channel video processor, one Dolby E audio channel per video processor channel, can be transcoded:





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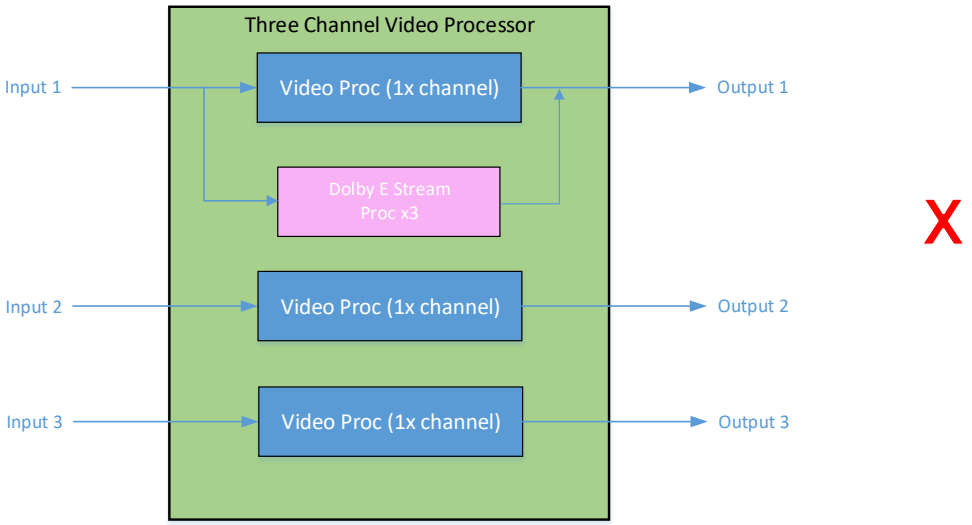
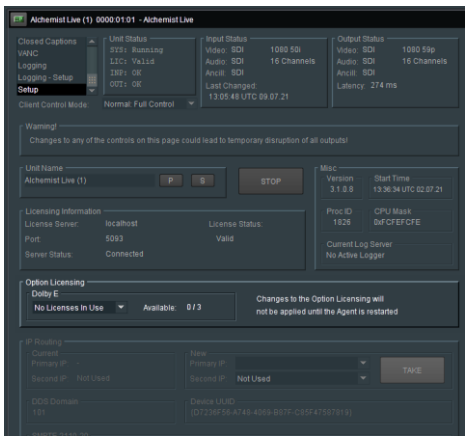
Note that it is not possible, in a 3 channel Alchemist Live configuration, to configure multiple Dolby E channel transcoding, with regard to a single video channel:



Alchemist Live – Dolby Configuration Procedure

1. **Applying the Option Licensing**

   In the Alchemist Live Setup menu, configure the **Option Licensing:**

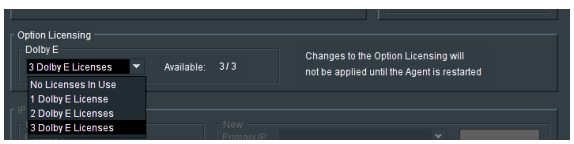


Note that the number of available licenses will depend upon how many have been purchased.

A single Alchemist Live can support up to three separate Dolby E transcodes.

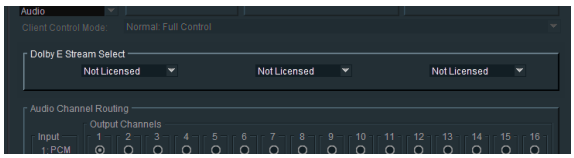
In the example above, three Dolby E licenses are available, but none have been applied.

The required license configuration can be selected using the drop down menu:



2. In the Alchemist Live Audio menu, it is required to define the incoming audio pairs that contain the incoming Dolby E stream(s).

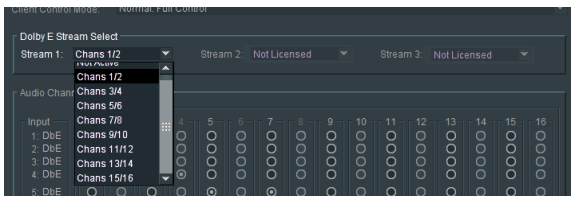
   When Alchemist Live is configured as a single channel video processor, the menu offers configuration of up to three Dolby E licenses:



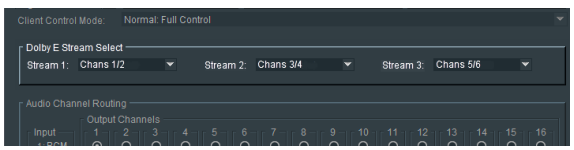
   When Alchemist Live is configured as a 3 channel video processor, the menu offers configuration of a single Dolby E license (one per video channel):

   The default state is **Not Licenced.**

   Licenses may be configured using the drop-down menu:



   The following example shows a single channel Alchemist Live, configured for three incoming Dolby E streams:



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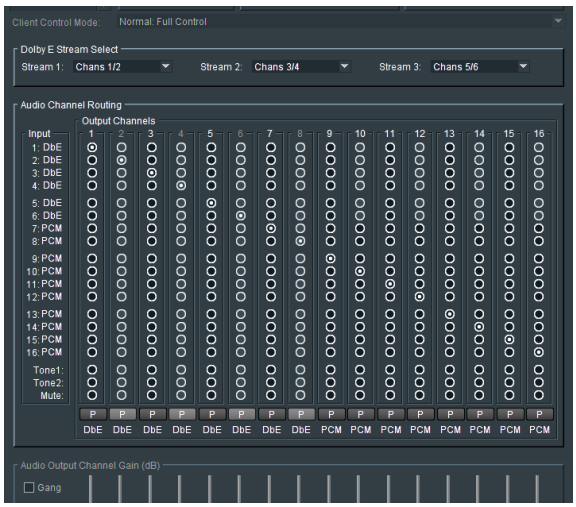
Note that the configured **Dolby E Stream Select** menu will be reflected in the **Audio Channel Routing** menu:



Note: if a Dolby E bitstream is applied to an input that has not been configured to accept a Dolby E input, and hence not licensed, then the input type will be identified as ‘N’ (Non-PCM).

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